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Kazuo Matsuyama et al.

Title

ELECTRONIC RIGHTS INFORMATION PROCESSING
SYSTEM, METHOD AND APPARATUS FOR
CARRYING OUT SAME AND RECORDED MEDIUM
FOR PROGRAM CARRYING OUT THE METHOD

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APPLICATION ELEMENTS

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1. ☒ Filing fee as calculated below.
2. ☒ Specification [Total Pages **[51]**]
(preferred arrangement set forth below)
- Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 USC 113) [Total Pages **[26]**]
4. Oath or Declaration [Total Pages **[3]**]
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(for continuation/divisional with Box 17 completed)
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6. ☐ Microfiche Computer Program (Appendix)
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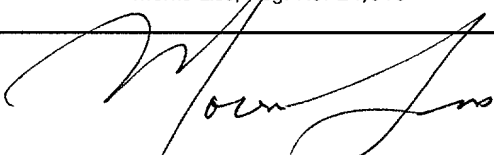
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TOTAL	33	minus	20	=	13	x9=	\$	x18=	\$234	
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Other Fee (specify purpose) <u>Assignment recordation</u>							\$		\$40	
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			June 6, 2000

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that we, KAZUO MATSUYAMA, a subject of Japan and residing at Shinjuku-ku, Tokyo, Japan, KO FUJIMURA a subject of Japan and residing at Shinjuku-ku, Tokyo, Japan and YOSHIHITO OSHIMA, a subject of Japan and residing at Shinjuku-ku, Tokyo, Japan have invented certain new and useful improvements in

"ELECTRONIC RIGHTS INFORMATION PROCESSING SYSTEM,
METHOD AND APPARATUS FOR CARRYING OUT SAME AND
RECORDED MEDIUM FOR PROGRAM CARRYING OUT THE
METHOD"

and we do hereby declare that the following is a full, clear and exact description of the same; reference being had to the accompanying drawings and the numerals of reference marked thereon, which form a part of this specification.

ELECTRONIC RIGHTS INFORMATION PROCESSING
SYSTEM, METHOD AND APPARATUS FOR CARRYING OUT
SAME AND RECORDED MEDIUM FOR PROGRAM CARRYING
OUT THE METHOD

5 BACKGROUND OF THE INVENTION

The invention relates to a treatment such as circulation of information corresponding to that which concerns the rights relating to a commercial trade or electronic information which signifies a variety of rights (hereafter referred to as electronic rights information or electronic ticket), and in particular, to a
10 method of and an apparatus for treatment of electronic rights information which safeguard the rights information against copying or falsification while allowing a safe stowage and circulation thereof, and a recorded medium having a program recorded therein which is used to carry out the method.

Recently, attempts are in progress which are intended to provide an
15 electronization or digitalization of rights information as contained in cash or tickets. Currently, such rights information is generally stowed in a portable medium such as an IC card or a magnetic card or managed in a concentrated manner by an issuer of rights information in the form of accounts located in a center database.

20 A system stowing rights information in accounts managed by the issuer is exemplified by "e-Ticket" from "digitimini" company. In this system, an IC card which verifies the identity of a user is handed to the user upon subscription. A ticket can be reserved through Web page, and reservation information is recorded in a database maintained by the e-Ticket.
25 The user shows his IC card when entering an auditorium, whereby a confirmation can be made if the user has previously made a reservation. Since the IC card has no storage of reservation information, this system is

characterized by the absence of any limit on the data capacity.

On the other hand, a system in which rights information is stowed in a portable medium is exemplified by an electronic cash system by MONDEX. In this system, electronic data which is equivalent to an amount of cash is
5 stored in a card, which is physically carried by a user. A payment in a store can be completed by transferring the cash data stored in the card to a card of the store. This system is characterized by its ability to allow an off-line transfer of cash data without utilizing a network.

Japanese Patent Publication No. 27,815/1996 proposes an electronic
10 asset data transfer method using a plurality of portable data carriers in which a trading is enabled by transferring electronic cash data or frequency data such as a service utilization privilege from a user's account or the like. According to this method, electronic asset data is normally stored in the account, and thus the method is characterized by being utilized by allowing a transfer as
15 required to a portable terminal unit which is convenient to use and which assures a high security.

A system such as the e-Ticket in which the issuer manages the account has a problem, in the first instance, that it is susceptible to falsification or deletion of the electronic rights information by the issuer. This does not
20 present any significant problem if the issuer can be trustworthy as for instance of flight tickets issued by airlines. But where the issuer is not trustworthy as in an instance of a personally issued bond, it is of primary importance to determine who manages the rights information.

In the second instance, for the management of the account by the
25 issuer, a network connection with the database of the issuer or the manager organization thereof is an essential requirement, and an issuance, a transfer, a ticket examination or the like is inhibited in an environment which makes

such network connection unavailable.

In the third instance, for the account management by the issuer, there is a problem that the management only covers those rights information issued by the issuer as a matter of course, and the stowage of other rights information is generally unavailable. A vicarious agency may issue and manage any other desired rights information without accompanying any significant technical difficulty, but its operation becomes complicated owing to the needs for a deed of contract which must be concluded between a client which desires the issuance of rights information and the vicarious agency and a payment of fees associated therewith.

On the other hand, the system in which rights information is stowed in a portable medium suffers from the problems as mentioned below. In the first instance, when issuing rights information or transferring it through a network, it is always necessary to have portable media of the both connected together to the network. An access is allowed at any time for the approach stowing rights in the account, while because the portable medium is physically carried by an individual, the system of this type is subject to the fact that time when the portable medium of the other party is connected to the network is greatly limited. Accordingly, upon issuing or transferring rights information, the both cards must be simultaneously put into terminals to make them in condition for use, as by communicating to each other. Accordingly, it is difficult to apply this approach for instances of use such as coupons or gift certificates which are unilaterally afforded from a transferer independently from the convenience and intent of a transferee.

In the second instance, an IC has a greatly limited capacity under the current status of art, and accordingly, the amount of electronic rights information which can be stored is limited.

It is to be noted that in the disclosure of Japanese Patent Publication No. 27,815/1996, the electronic asset data is transferred as required from the account to a portable medium to enable a transaction, thus enabling some of the problems mentioned above to be overcome. However, it is premised that the issuer of the electronic asset data remains to be only the bank which manages the account, and thus there cannot be provided an account where a variety of rights information issued by a number of issuers can be managed. There also remains a problem that it is difficult to control a range of circulation which varies from one rights variety to another and a verification of qualification of a ticket examiner.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an electronic rights information processing system which is capable of managing a variety of electronic tickets in the form of transferable and consumable rights information in large quantities and enabling a transfer and/or consumption thereof, a method and an apparatus for carrying out same, and a recorded medium having a program which is used to carry out the method recorded thereon.

It is another object of the invention to provide an electronic rights information processing system which enables a unilateral transfer of an electronic rights information without mutual communication with a transferee, a method of and an apparatus for carrying out same, and a recorded medium having a program which is used to carry out the method recorded thereon.

It is a further object of the invention to provide an electronic rights information processing system which reveals any illicit use of an illicitly obtained electronic rights information, a method of and an apparatus for carrying out same, and a recorded medium having a program which is used to

carry out the method recorded thereon.

A method according to the invention comprises:

introducing an account unit which is managed by a user or a third
party organization which is designated by the user rather than by an issuer
5 unit,

when electronic rights information is to be issued by an issuer unit,
transmitting an account address and a demand for issuance from a
user terminal unit to the issuer unit;

connecting the issuer unit with an account unit corresponding to the
10 account address;

obtaining a user identifier of the user terminal unit from the account
unit;

preparing electronic rights information inclusive of the user identifier;
transmitting the electronic rights information to the account unit;
15 and the account unit storing the electronic rights information in
storage means.

Upon receipt of the demand for issuance, the issuer unit accesses the
account address of the user;

the accessed account unit transmits an account address certificate to
20 the issuer unit, the account address certificate guaranteeing a correspondence
relationship between the account address assigned to the user and the
identifier of an owner of the account unit;

the issuer unit verifies the account address certificate, and upon
successful verification, treats the owner identifier contained in the address
25 certificate as the user identifier;

and stores the received electronic rights information in the storage
means.

A method of consuming electronic rights information comprises:
deriving an account address from a portable processor and
transmitting it to a ticket examiner unit;
connecting the ticket examiner unit with an account unit at the account
5 address to demand required electronic rights information;
causing the account unit to derive the demanded electronic rights
information and to transmit to the ticket examiner unit;;
and the ticket examiner unit verifying the electronic rights information
and rendering a decision to enable or disable a ticket examination.

10 The ticket examiner unit demands the portable processor to generate a
signature to a certificate of consumption and verifies a certificate of
consumption with signature.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing an exemplary arrangement of an
15 electronic ticket system;

Fig. 2A is a block diagram showing an exemplary functional
arrangement of an issuer unit;

Fig. 2B is a block diagram showing an exemplary functional
arrangement of an account unit;

20 Fig. 3A is a view showing a more detailed functional arrangement of
the account unit;

Fig. 3B is a block diagram showing an exemplary functional
arrangement of a user terminal unit;

Fig. 4A a block diagram showing an exemplary functional
25 arrangement of a portable processor;

Fig. 4B a block diagram showing an exemplary functional
arrangement of a ticket examiner unit;

Fig. 5 is an illustration of an electronic ticket;

Fig. 6 is an illustration of a transfer certificate;

Fig. 7 is an illustration of a consumption certificate;

Fig. 8A is a view showing an example of a simplified transfer
5 certificate;

Fig. 8B is a view showing an example of a simplified consumption
certificate;

Fig. 9 is a view showing an example of a certificate of user
inscription;

Fig. 10 is a view showing an example of a certificate of certificate of
10 inscription;

Fig. 11 is a view showing an exemplary certificate of account address;

Fig. 12 is a chart showing a main flow of a user authenticator upon
accepting a portable processor;

Fig. 13 is a chart showing a main flow occurring on a display of a
15 transferer user upon a transfer;

Fig. 14 is a flow chart of an account controller upon displaying a list
of tickets;

Fig. 15 is a view showing a main flow in an electronic ticket processor
20 associated with a transferer account unit upon a transfer;

Fig. 16 is a flow chart of a verification of an account address in a user
terminal unit;

Fig. 17 is a chart showing a main flow in an electronic ticket processor
of a transferee account unit upon a transfer;

Fig. 18 is a chart showing a main flow in a display of a transferee user
25 terminal unit upon issuance;

Fig. 19 is a flow chart of an issued information generation controller

upon issuance;

Fig. 20 is a chart showing a main flow in an electronic ticket processor associated with an issuer unit upon issuance;

Fig. 21 is a chart showing a main flow in an electronic ticket processor of a transferee account unit upon issuance;

Fig. 22 is a flow chart of a user terminal unit upon consumption;

Fig. 23 is a flow chart of an electronic ticket processor associated with a ticket examiner unit upon consumption;

Fig. 24 is a chart showing a main flow in an electronic ticket processor of a consumer account unit upon consumption;

Fig. 25 is a flow chart of the verification of the validity of a ticket;

Fig. 26 is a flow chart of the verification of a certificate of inscription;

Fig. 27A is a flow chart of the verification of circulation condition;

Fig. 27B is a flow chart of the verification of circulation condition on the examiner side;

Fig. 28 is a flow chart of the verification of circulation condition on the side being examined;

Fig. 29 diagrammatically shows an entire sequence during a transfer treatment;

Fig. 30 diagrammatically shows an entire sequence during an issuance treatment; and

Fig. 31 diagrammatically shows an entire sequence during a consumption treatment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Several embodiments of the present invention will now be described with reference to the drawings.

Block arrangement

Fig. 1 is a block diagram of an electronic ticket system which incorporates an account unit according to one embodiment of the invention. As shown in Fig. 1, the system comprises a plurality of issuer units 100
5 connected to a communication network 10 such as an internet, for example, an account unit managing center 200 covering a plurality of account units, user terminal units 300A, 300B, ... (any one being denoted by 300), a plurality of ticket examiner units 500, a system manager center 700 and portable
10 processors 400A, 400B, ... (any one being denoted by 400) such as an IC card or the like which can be loaded into the user terminal unit 300 and the ticket examiner units 500 acting as a terminal unit.

The account managing center 200 includes a number of account units 210, each of which is assigned a globally unique account address as an account number. In the electronic ticket system according to the present
15 invention, the account managing center 200 is provided independently from an organization which issues an electronic ticket.

Issuer unit 100:

Each issuer unit 100 represents means which is used by various organizations to issue respective rights information in the form of an
20 electronic ticket, and as shown in Fig. 2A, it comprises an issued information generation controller 101, an electronic ticket processor (issuing section) 102 and a signature unit 103.

Account managing center 200:

The account managing center 200 is always open on a network, and a
25 user can deposit a variety of electronic tickets which the user has obtained into an account address assigned to the user as a result of the electronic ticket system utilization contract, so that the electronic tickets can be saved

in that account or any intended one of the electronic tickets saved in the account can be withdrawn for use (or consumption). An electronic ticket may be transferred into the account by the issuer unit in response to a demand for issuance of an electronic ticket delivered thereto, or another entity
5 (individual, organization, corporation) may pay an electronic ticket such as a gift card, coupon or the like into the account address independently from the intent of a user of the account. In this manner, the transfer into each account does not require a key of the recipient, and anybody who knows the account number can transfer an electronic ticket into it. However, the transfer to
10 another and/or consumption of an electronic ticket which is stowed at the account address is allowed only when the owner of the account has loaded his portable processor 400 into the user terminal unit 300 or the ticket examiner units 500.

The account managing center 200 is an organization which is
15 independent from an electronic ticket issuing organization, and comprises a plurality of account units 210A, 210B, ... (any one being denoted by 210), as shown in Fig. 2B. A user who intends to utilize a service offered by the electronic ticket system is given an account address. A corresponding account unit 210 saves and manages the electronic ticket of the user. Each
20 account unit 210 manages a single account, and comprises an account controller 202, an electronic ticket processor 203 and a storage 204. More specifically, in addition to the account controller 202 and the storage 204, the account unit 210 comprises a transmitter/receiver 211, a consumption processor 212, a transferer processor 213, a transferee processor 214, and a
25 junction 215 for connection with a user terminal unit, all of which constitute together the electronic ticket processor 203, as shown in Fig. 3A. Each storage 204 may utilize a memory such as a high capacity hard disc, which

affords a sufficiently high capacity for a user to utilize it in order to save the electronic tickets.

User terminal unit 300:

User terminal unit 300 represents means by which a user can retrieve,
5 purchase or transfer an electronic ticket on a net, and is implemented in a PC located at a user's home PDA, portable phone or a KIOSK terminal which is installed in a ticket bureau where a variety of electronic tickets are sold, a gift coupon/merchandise coupon sales room of a department store or the like, and comprises a display 301, a user terminal controller (a junction with the
10 account unit) 302, a junction 303 with a portable processor such as an IC card reader/writer or the like, and an input unit 304, as shown in Fig. 3B.

Portable processor 400:

The portable processor 400 such as an IC card or the like represents means which a user utilizes when using (transferring or consuming) an
15 electronic ticket by inserting it into the user terminal unit 300 or the ticket examiner unit 500, and comprises a signature unit 401 which is used to produce a signature attached to a certificate of transfer or a certificate of consumption during a transfer or consumption of an electronic ticket, a storage 402 for storing a user identification information user ID and an
20 account address of a user, and a junction 403 with the user terminal unit, as shown in Fig. 4A. It is to be noted that the portable processor 400 itself does not contain an electronic ticket body, but retains the function of accessing an account unit in which an electronic ticket specified by the account address is saved. It is to be noted that in the description to follow, where a reference to
25 "a certificate of transfer" or "a certificate of consumption" is simply made, this means an unsigned certificate of transfer or consumption, and any such certificate which is signed or attached with a signature will be referred to as

“a certificate of transfer with signature” or “a certificate of consumption with signature”.

The certificate of transfer and the certificate of consumption are not always required to implement the present invention, but in embodiments to be described later in which these certificates are used, it is required in either the transfer or the consumption of the electronic ticket that

(a) a user attaches his signature to the certificate of transfer or consumption with the signature unit 401 of the portable processor 400, and hands it to the transferee or the ticket examiner together with the electronic ticket. The signature is made with a secret key, which is produced in a pair with an public key, for example, and the public key may be used to verify the validity of the signature;

(b) when transferring or consuming the electronic ticket, the electronic ticket be transferred with all of past certificates of transfer and/or consumption with signature which have been attached to the electronic ticket as an attachment to the electronic ticket, thus allowing a profiteer to be pursued in the event of an illicit use.

In this embodiment, no key is provided in the account of the user, and thus it is possible to present a certificate of the account address from the account unit of another person. This allows usurpation of the electronic ticket by successfully impersonating oneself with the account address of another person. However, when using (transferring or consuming) the electronic ticket which is illicitly usurped, it is impossible to attach a signature which corresponds to the authentic user ID because of a lack of knowledge of the secret key of the authentic user. In other words, the electronic ticket cannot be used.

Since the owner ID 605 of the certificate of transfer 60B prepared by

the transferer should be the user ID of the proper transferee, it is impossible to attach the signature of the authentic transferee to the certificate of transfer or consumption which is prepared by the illicit acquirer when using the electronic ticket which is illicit acquired. If the signature of the illicit
5 acquirer himself is attached, this signature cannot be verified with the public key of the authentic transferee, whereby the injustice will be revealed.

If the illicit acquirer of the electronic ticket makes a signature to the certificate of transfer or consumption using his own portable processor on the basis of the account address and a user ID of himself, rather than attaching the
10 certificate of transfer or consumption which has originally been attached to the electronic ticket, the continuity of transition of owners which are stated on the series of certificates of transfer and/or consumption with signature which are attached to the electronic ticket will be lost, thus allowing an ex post facto reveal. Accordingly, the electronic ticket processing system according to the
15 present invention is characterized in that an illicit acquisition of the electronic ticket using certificate of account address of another person does not present any significant problem whatsoever.

Ticket examiner units 500:

Each ticket examiner units 500 is installed at a number of locations
20 where the use of an electronic ticket is accepted such as a hotel, a concert hall, an airport counter or the like, for example, for examining (consuming) a single variety or a plurality of varieties of electronic tickets. The ticket examiner units 500 establishes a connection with the user account unit to enable a necessary processing to be conducted whenever the portable
25 processor 400 of the user is loaded therein, and is similar to the user terminal unit in this respect and may be considered as a kind of terminal unit. As shown in Fig. 4B, each ticket examiner units 500 comprises an electronic

ticket processor 501, a ticket examination controller 502, a junction 503 with a portable processor such as an IC card reader/writer or the like and a storage 504. Any electronic ticket which is consumed in the ticket examiner units 500 is temporarily stored in the storage 504 of the ticket examiner units 500 together with the attached certificate of transfer with signature and with a certificate of consumption with signature which is prepared as a result of the consumption treatment, or is immediately transmitted to the system manager center 700.

System manager center 700:

The system manager center 700 verifies the continuity of owners by utilizing electronic tickets, attached certificates of consumption with signature and/or any certificates of transfer with signature which are returned, and pursues a profiteer if any illicit use is found.

Any kind of electronic rights information such as an electronic ticket, a certificate of transfer, a certificate of consumption, a certificate of user inscription, a certificate of ticket examiner inscription, a certificate of account address and the like which is always used or used as required in the electronic ticket processing system according to the present embodiment to be described herebelow is represented all fundamentally in the similar format, and therefore an applicable description will not be repeatedly given. It should be understood that such rights information may also be represented in respective unique format.

Electronic ticket

An electronic ticket is a representation of the right to claim a service or an article in the form of a digital information, and the electronic ticket as termed in the present invention signifies any rights information including a coupon, a beer coupon, a merchandise coupon, a gift coupon, a point card, a

subscription coupon, a lagnappe coupon, a sample coupon, a purchased goods receipt, an entrance ticket, a concert ticket, a flight ticket, a lodging coupon, a meal coupon, a coupon ticket, a bill of lading, a stock certificate, an option certificate or the like.

5 Fig. 5 shows a concert ticket as an example of an electronic ticket 60A.

As shown in Fig. 5, a single electronic ticket 60A comprises a ticket schema ID 601, a ticket ID 602, an issuer ID 603, a variety of rights 604, a rights information 610, an issuance condition 620, a transfer condition 630, a
10 consumption condition 640, an owner ID 605 and an issuer signature 606.

The ticket schema ID 601 is a globally unique identifier which represents a variety of the ticket. The ticket ID 602 is a globally unique identifier which is assigned to each ticket. The issuer ID 603 represents a globally unique identifier which is assigned to each issuer. The variety of
15 rights 604 indicates the title of the right signified by the electronic ticket. The rights information 610 represents the content of the right guaranteed by the electronic ticket, and has a structure which differs from ticket schema to ticket schema. For example, the concert ticket shown in Fig. 5 comprises the name of an artist and the day of the concert.

20 The issuance condition 620 comprises a transmitter demand ticket schema ID 621 and a receiver demand ticket schema ID 622, and indicates conditions which are demanded upon issuance treatment. The transfer condition 630 comprises a transferability 631, a transmitter demand ticket schema ID 632, and a receiver demand ticket schema ID 633, indicating the
25 transferability and conditions which are required for the transfer treatment. The consumption condition 640 comprises an effective period 641, an effective number of times 642, a transmitter demand ticket schema ID 643,

and a receiver demand ticket schema ID 644, indicating conditions which are required for the consumption treatment. The transmitter demand ticket schema ID which is stated in each of the issuance condition 620, the transfer condition 630 and the consumption condition 640 refers to an electronic ticket (hereafter referred to as certificate of inscription) which must be retained by a transmitting device when the ticket is put in circulation, namely, the issuer for the issuance, the account of the transferer for the transfer, and the account of the consumer for the consumption.

The receiver demand ticket schema ID stated in each of the issuance condition 620, the transfer condition 630 and the consumption condition 640 refers to a certificate of inscription which must be retained by a receiving device when the ticket is put in circulation, namely, the account of the person to whom the ticket is issued for the issuance, the account of the transferee for the transfer, and the ticket examiner for the consumption. In the preset embodiment, the circulation condition such as the issuance condition, the transfer condition, the consumption condition or the like is specified by the schema ID of the certificate of inscription which must be retained in the transmitter or the receiver as mentioned above. However, as an alternative choice, an public key of CA (certificate authority) bureau which issues a certificate of inscription or an identifier of an public key certificate may be specified, and the retention of the public key certificate issued by the CA bureau may be used as the circulation condition. Any one of the issuance condition, the transfer condition and the consumption condition may be omitted depending on the embodiment.

The owner ID 605 represents the identifier of the owner of the ticket. The issuer signature 606 is a signature which is made by the issuer unit.

The signature 606 of the issuer unit is the signature which guarantees

the contents mentioned under 601 to 644. The signature is made with respect to the combination of 601 to 644. E-SIGN of NTT or the like may be used as a signature technique.

Certificate of transfer/consumption

5 Fig. 6 shows an example of the certificate of transfer. A certificate of transfer 60B is a proof of the transfer of the electronic ticket 60A. Specifically, it indicates that the owner ID 605 stated in the electronic ticket 60A being transferred is changed to the owner ID of the transferee user. Subsequently, during the transfer of the electronic ticket, the certificate of transfer is attached to the electronic ticket for purpose of circulation. As shown in Fig. 6, the format of the certificate of transfer 60B remain the same as the format for the electronic ticket 60A, and the issuer ID 603 is the transferer ID or the owner ID of the ticket being transferred. The rights information 610 in the certificate of transfer 60B may comprise a transfer ticket schema ID, a transfer ticket ID and date of issuance. The owner ID of the transferee is stated under the owner ID 605. The issuer signature is made by the transferer. Each time the electronic ticket is transferred, the certificate of transfer with signature on which the current owner ID 603 and the new owner ID 605 are recorded is attached thereto.

20 As shown in Fig. 7, the certificate of consumption 60C has the same format as the certificate of transfer shown in Fig. 6, and therefore will not be described. However, while the certificate of transfer 60B provides a proof of the transfer of the electronic ticket 60A, the certificate of consumption with signature 60C provides a proof of the consumption of the electronic ticket 60A. As a result of the consumption, the owner ID 605 of the original electronic ticket 60A is entered in the issuer ID 603 of the certificate of consumption 60C, and the owner ID 605 remains blank.

It is also possible to implement the certificate of consumption as a certificate of transfer indicating that a new owner is NULL. In another embodiment, rather than implementing the certificate of transfer in the form of an electronic ticket, it may comprise a trio of a signature 60B3 by the
5 current owner with respect to a set of ticket information 60B1 indicating an object being transferred and a new owner ID 60B2 as shown in Fig. 8A. In the similar manner, rather than implementing the certificate of consumption in the form of an electronic ticket, it may comprise a trio of a signature 60C3 by a current owner with respect to a set of ticket information 60C1 indicating an
10 object being consumed and a new owner ID (NULL) 60C2 as shown in Fig. 8B. It is possible to specify ticket information in terms of schema ID + ticket ID of the electronic ticket, a hashed value of the entire electronic ticket or an issuer signature of the electronic ticket.

A consumed electronic ticket is transmitted to the system manager
15 center 700 together with any certificate of consumption with signature and/or any attached certificate of transfer with signature which may have been prepared in connection with this electronic ticket in order to detect any illicit use such as a double use by verifying the succession of owner ID's (the continuity of successive owners) on the series of attached certificates of
20 transfer and consumption with signature, for example, thus pursuing a profiteer in the event of an illicit use. However, such certificate or certificates of transfer and consumption with signature may not be attached where there is no need for a later detection of a dishonest user for a double use or when an electronic ticket which has been used on the on-line has been
25 made open to the public.

Certificate of user inscription

Fig. 9 shows an example of a certificate of user inscription. A

certificate of user inscription 60D is a kind of membership card which is required in the circulation of the electronic ticket 60A. An inscription organization such as CA guarantees the identification of the user to permit a circulation of the electronic ticket. The certificate of user inscription 60D
5 has the similar format as the electronic ticket 60A. In Fig. 9, an issuer ID 603 represents the identifier of an inscription organization. An issuer signature 606 represents a signature of the inscription organization.

Certificate of ticket examiner inscription

Fig. 10 shows an example of a certificate of ticket examiner
10 inscription. A certificate of ticket examiner inscription 60E signifies the right to perform a ticket examination during the consumption (use) of the electronic ticket in any circulation process of the electronic ticket, and a variety of rights 604 represents a certificate of the right to examine the ticket.

The certificate of ticket examiner inscription is issued by a service
15 provider who intends a circulation of a certain electronic ticket 60A, for example, as a license to examine, to a person who actually examines the electronic ticket. The owner of the certificate of ticket examiner inscription is specified under an owner ID 605, and a signature of the issuer unit with respect to the certificate of ticket examiner inscription is given under an issuer
20 signature 606.

To give an example, the transmitter demand ticket schema 643 given under the consumption condition of the electronic ticket shown in Fig. 5 states a certificate of user inscription which is also referred to as a certificate of the right to consume which must be retained by a transmitting side, namely, a
25 user who intends to consume. If the consumer does not possess the certificate of user inscription, he cannot consume this electronic ticket. Similarly, the receiver demand ticket schema 644 under the consumption

condition states a certificate of ticket examiner inscription which must be retained by the receiving side or a ticket examiner. If the ticket examiner does not possess the certificate of the ticket examiner inscription which is here stated, the consumer must not allow the ticket examiner to examine this ticket.

Certificate of account address

Fig. 11 shows a certificate of account address 60F which is one example of the address certificate. An account address refers to an address of an account unit which is assigned to a user, and in the present embodiment, it is specified by using URI (Universal Resource Identifier) standardized by IETF or the like. However, any other representation such as an account manager ID + serial number which has a unique value may also be used.

An owner ID represents an identifier of the owner of an electronic ticket. In the present embodiment, each user holds a unique portable processor, the identifier of which is used as a user ID and is also used as an owner ID of the certificate of account address. An identifier of the portable processor may use a value which is determined according to any method provided it has a unique value, such as a portable processor issuer ID + serial number, an public key of a signature unit within the portable processor, a hashed value of the public key, an identifier of the certificate of public key, a hashed value of the certificate of public key or the like.

The certificate of account address 60F guarantees a correspondence relationship between the account address and the user ID, and is signed by a trustworthy account managing center, CA bureau, a user himself or the like.

The account address may be directly used as the user ID. However, when this choice is made, when it becomes necessary to change the user ID for reason that the user has lost the portable processor, it becomes necessary

that the account address be also changed. However, the account address is an item which is broadly informed to enterprises and individuals with whom a trading relationship is maintained, in the similar manner as a bank account number or an electronic mail address, and it is not a simple matter to change it frequently. On the other hand, when the user ID and the account address are made separate from each other while the correspondence relationship is guaranteed by a certificate of account address, there is an advantage that when the user ID is changed, a re-issue of a new certificate of account address does away the need to change the account address.

A single user can retain a plurality of account units. An implementation is therefor possible in which the same account address is assigned to each of these account units and a particular account unit which is utilized may be changed depending on the variety of the electronic ticket which stores it or the current location of the user. For example, when PC of a user's home is connected to a network, an account unit on the PC may be utilized. At other time, the account unit may be switched to an account unit on the host of a contracted internet provider. An account address which is representative of a plurality of account units is referred to as a representative address, in particular.

In Fig. 11, a variety of right 604 represents a certificate of account address, and rights information 610 comprises an account address. The owner ID is usually changed as the portable processor 400 or the key is changed, and thus the use of the certificate of account address provides an advantage that a change in the account or the key can be easily accommodated for in implementing the electronic ticket.

Flow chart

An embodiment of the issuer unit 100, the account unit 210, the user

terminal unit 300 and the ticket examiner units 500, which are components of the invention in the system shown in Fig. 1, will now be described with reference to the drawings.

Access from user terminal unit to account unit

5 Fig. 12 shows a flow of the user terminal unit 300 when the portable processor (such as IC card) 400 is accepted.

Step 1001: The portable processor 400 is connected to the junction 303 (Fig. 3B) of the user terminal unit 300.

Step 1002: The portable processor 400 is verified to render a decision to see if
10 it is portable processor adapted to the present system. In the event the portable processor 400 finds that the user terminal unit 300 is not trustworthy, the portable processor 400 may verify the user terminal unit.

Step 1003: A decision is rendered on a result of verification.

Step 1004: In the event of a failed verification or finding that the portable
15 processor is not adapted, an exception event is raised, and the treatment is terminated.

Step 1005: If the portable processor is adapted, the account address of the account unit is read from the storage 402 of the portable processor 400.

Step 1006: A connection to the electronic ticket processor 203 of the account
20 unit 210 which is indicated by the account address is demanded.

 If the portable processor 400 is found not to be trustworthy as viewed from the account unit 210, it is possible that the account unit 210 verifies the portable processor 400. A technique for this verification may comprise a confirmation to see if the portable processor 400 contains a secret key
25 corresponding to the account unit 210.

 Conversely, if the account unit 210 is found not to be trustworthy as viewed from the portable processor 400, it is possible that the portable

processor verifies the account unit. In this instance, if the account unit 210 itself does not contain a secret key, the managing center 200 which manages the account unit 210 may provide an authentication key, and the user may use this key to verify the managing center 200. The electronic ticket processor 203 of the account unit 210 which has received the connection demand executes the connection with the user terminal unit 300.

Step 1007: When the connection with the electronic ticket processor 203 of the account unit 210 is successfully made, a connection notice is received from the account unit 210, thus completing the connection.

A configuration in which the portable processor 400 is separate from the user terminal unit 300 is illustrated here, but it is also possible that the user terminal unit 300 itself has the authentication function, thus providing an integral configuration.

Transfer (See Fig. 29)

Fig. 13 shows a main flow which is executed by the terminal controller 302 of the user terminal unit 300A on the transferer site during a transfer of an electronic ticket.

Step 2000: Either by a manual input using the input unit 304, for example, or by the connection technique shown in Fig. 12, a user A inputs the account address of his own account unit 210A to the user terminal unit 300 for connection with the account unit 210A thereof.

Step 2001: The terminal controller 302 demands the account controller 202 of the account unit 210A to show a list of electronic tickets information which is stowed in the storage 212.

Step 2002: The list of electronic tickets which is received from the account unit 210A is displayed on the display 301.

Step 2003: A ticket to be transferred is selected from the displayed list by

using the input unit 304, and the account address of a transferee user B is inputted.

Step 2004: The specified electronic ticket and the account address of the transferee user B are communicated to the account unit 210A.

- 5 Step 2005: A certificate of account address of the transferee is received from the account unit 210A and is verified.

Step 2006: A result of verification of the certificate of the account address and a demand for the execution of the transfer treatment are transmitted to the account controller 202 of the account unit 210A.

- 10 Step 2007: A certificate of transfer is received from the account controller 202, and is then transmitted to the portable processor 400A, demanding a signature.

Step 2008: A certificate of transfer with signature is received from the portable processor 400A, and is then transmitted to the account unit 210A.

- 15 Step 2009: A result of the execution of the transfer treatment is received from the account unit 210A.

Step 2010: A result of execution is displayed on the display 301.

Fig. 14 shows a flow of the account controller 202 generating a list of electronic tickets which is demanded at step 2001 in Fig. 13.

- 20 Step 2101: The account controller 202 demands a ticket index to the electronic ticket processor 203.

The electronic ticket processor 203 derives a ticket index retained by the storage 204, and transmits it to the account controller 202.

Step 2102: The account controller 202 receives the transmitted ticket index.

- 25 Step 2103: A screen generating information (for example, html image information) for the ticket list information is generated on the basis of the acquired index information.

Step 2104: The screen of the ticket list information thus generated is transmitted to the demanding user terminal unit 300.

Fig. 15 shows a main flow executed by the electronic ticket processor 203 under the control of the account controller 202 of the transferer account unit 210 in response to the transferee account address which has been transmitted at step 2004 in Fig. 13.

Step 2301: To begin the treatment, an access is initially made to the transferee account unit 210B at the transferee account address which is received from the user terminal unit 210A.

10 Step 2302: As a result of the access, a certificate of account address is transmitted from the transferee account unit 210B.

Step 2303: The certificate of account address which is transmitted is transmitted to the demanding user terminal unit 300A (to step 2005 in Fig. 13).

15 Step 2304: The result of verification and a demand for the transfer which are transmitted at step 2006 from the user terminal unit are received.

Step 2305: A decision is rendered upon the result of verification.

Step 2306: If the result of verification is failing, an exception event is raised, and the treatment is terminated.

20 Step 2307: A circulation condition of the transferee which is stated on the ticket is verified.

Step 2308: A decision is rendered on a result of verification.

Step 2309: If the verification fails, an exception event is raised, and the treatment is terminated.

25 Step 2310: If the condition is complied with, the ticket body is transmitted to the account unit 210B of the transferee side.

Step 2311: The result of verification at the transferee side is transmitted, and

thus is received.

Step 2312: A decision is rendered upon the result of verification.

Step 2313: If the result of verification is failing, the treatment is terminated.

Step 2314: If the result of verification is proper, a certificate of transfer is

5 prepared.

Step 2315: The certificate of transfer is transmitted to the user terminal unit 300A of the transferer side, demanding a signature (to step 2007 in Fig. 13).

Step 2316: The certificate of transfer with signature is received from the user terminal unit 300A, and is then transmitted to the account unit of the

10 transferee.

Step 2317: A report that the transfer has been completed is transmitted to the user terminal unit 300 (to step 2009 in Fig. 13).

Fig. 16 shows a flow of the verification of a certificate of account address which takes place at step 2005 in the user terminal unit 300A.

15 Step 2401: The certificate of account address of the transferee which is transmitted from the own account unit 210A at step 2303 in Fig. 15 is received.

Step 2402: The validity of the certificate of account address is verified.

Step 2403: A decision is rendered upon the result of verification.

20 Step 2404: If it is revealed as a result of the verification that the certificate is not proper, an exception event is raised and the treatment is terminated.

Step 2405: If the certificate is found to be proper, a verification is made to see if a coincidence is reached between the account address of the transferee which is inputted by the transferer user at step 2003 and the account address which is described on the certificate of account address of the transferee which is received at step 2401.

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Step 2406: A decision is rendered upon the result of verification.

Step 2407: If the coincidence is not found, an exception event is raised and the treatment is terminated.

Step 2408: If the coincidence is reached, the treatment is then terminated, proceeding to step 2006 in Fig. 13.

5 Fig. 17 shows a main flow of the electronic ticket processor of the account unit 210B of the transferee during the transfer.

Step 2501: When the transfer treatment is demanded from the transferer account unit 210A, a certificate of account address is initially transmitted to the transferer account unit 210A.

10 Step 2502: An electronic ticket body is received from the transferer account unit.

Step 2503: The validity of the received ticket is verified.

Step 2504: The transferer circulation condition which is described on the received ticket is verified.

15 Step 2505: A decision is rendered upon the result of verification.

Step 2506: If it is found that the circulation condition is not agreed with, an exception event is raised and the treatment is terminated.

20 Step 2507: If the circulation condition is agreed with, the result of verification is communicated to the transferer account unit 210A while retaining the electronic ticket body.

Step 2508: The certificate of transfer is received from the transferer account unit 210A, and is attached to the ticket body which is previously received to be stored in the storage, whereupon the treatment is terminated.

Issuance (see Fig. 30)

25 A treatment which occurs when selecting a desired ticket from plays, sports, concerts or the like on the issuer unit 100, acting as a ticket bureau, for example, through the internet and having an electronic ticket issued (or

purchased) will be described.

Fig. 18 shows a main flow in the user terminal unit during the issuance of an electronic ticket.

Step 3001: The user terminal unit 300 demands the issued information
5 generating controller 101 of the issuer unit 100 (Fig. 2A) to show a list of electronic tickets which are being issued by the issuer unit.

The issued information generating controller 101 transmits information representing the list of electronic tickets which can be issued to the user terminal unit.

10 Step 3002: The terminal controller 302 receives the list of electronic tickets.
Step 3003: The list of electronic tickets which is received is displayed on the display 301.

Step 3004: A user (purchaser or transferee) selects an electronic ticket, the issuance of which he desires, from the electronic tickets displayed in the list,
15 and inputs the account address of the account unit of the transferee. The account address may be inputted from the input unit 304 of the user terminal unit 300 when accepting the issuance or may be acquired from the portable processor 400 which is loaded into the user terminal unit 300.

Step 3005: A demand for the execution of an issuance treatment is transmitted
20 to the issued information generating controller 101 together with the electronic ticket selection information representing the selected electronic ticket.

Step 3006: A result of the execution of the issuance treatment (an electronic ticket) is transmitted from the issued information generating controller 101,
25 and thus is received.

Step 3007: The result of the execution of the treatment is displayed on the display 301.

Fig. 19 shows a flow in the issued information generating controller 101 of the issuer unit 100 during the issuance of an electronic ticket.

Step 3101: Upon receiving a demand for the list of electronic tickets, the issue controller 101 demands the electronic ticket processor 102 to generate a list of electronic tickets.

Step 3102: The electronic ticket processor 102 generates an image data for the list of electronic tickets which can be issued.

Step 3103: The issue controller 101 transmits the image data of the list of electronic tickets to the demanding user terminal unit 300.

Step 3104: The issue controller 101 receives a demand for issuance of an electronic ticket and an electronic ticket selection information from the user terminal unit 300.

Step 3105: The electronic ticket processor 102 executes a demanded electronic ticket issuance treatment (Fig. 20).

Step 3106: The electronic ticket processor 102 generates display image information which indicates a result of issuance treatment.

Step 3107: The issued information generating controller transmits the generated display image information to the user terminal unit 300A.

Fig. 20 shows a flow of the issuance treatment of an electronic ticket which takes place at step 3105 during the issuance of an electronic ticket in Fig. 19.

Step 3201: To begin the treatment, an access is made to the account unit of the transferee (the entity demanding the issuance) at the account address, in the similar manner as the treatment shown in Fig. 15.

Step 3202: As a result of the access, a certificate of the account address is transmitted.

Step 3203: The validity of the certificate of account address which is transmitted is verified.

Step 3204: A decision is rendered upon the result of verification.

Step 3205: If the certificate of account address is found not to be proper, an exception event is raised and treatment is terminated.

Step 3206: If the certificate is found to be proper, an electronic ticket is
5 prepared on the basis of a user ID described on the certificate of account address (with the user identifier embedded into the ticket) and is issued.

Step 3207: The receiver circulation condition described on the ticket thus prepared is verified.

Step 3208: A decision is rendered upon the result of verification.

10 Step 3209: If the described condition is not agreed with, an exception event is raised and the treatment is terminated.

Step 3210: If the condition is agreed with, the electronic ticket body is transmitted to the account unit of the transferee (the user demanding the issuance).

15 Step 3211: A variety of verifications of the transmitted electronic ticket are also made on the transferee account unit, and results of such verifications, are then received.

Step 3212: The received result is verified.

20 Step 3213: Whenever a problem occurs, an exception event is raised and the treatment is terminated.

Fig. 21 shows a main flow in the electronic ticket processor of the account unit 210 of the transferee during the issuance of an electronic ticket.

Step 3301: When there is an access from the issuer unit 100 (step 3201 in Fig. 20) and the issuance treatment is demanded, a certificate of account address is
25 initially transmitted.

Step 3302: An electronic ticket body is transmitted from the issuer unit, and thus is received.

Step 3303: The validity of the received electronic ticket is verified.

Step 3304: The transmitter circulation condition which is described on the received ticket is verified.

Step 3305: A decision is rendered upon the result of verification.

- 5 Step 3306: If the circulation condition is not agreed with, an exception event is issued and the treatment is terminated.

Step 3307: If the circulation condition is agreed with, the electronic ticket is stowed in the storage 204 and the result of verification is communicated to the issuer unit.

- 10 Step 3308: The electronic ticket is stowed in the storage 204 and the treatment is terminated.

In this flow of the treatment which takes place in the transferee account unit during the issuance treatment, what is performed is only the verification of the transmitter circulation condition which is described on the electronic ticket, and no control is exercised on whether or not the issuer unit is proper. In this manner, it becomes possible to transmit a coupon or a gift coupon freely. However, the flow may be modified so that the electronic ticket cannot be received without a permission of reception which is previously transmitted from the user terminal unit in order to accommodate for an issuing business which may transmit a large quantity of electronic tickets such as span mail.

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Consumption (see Fig. 31)

Fig. 22 shows a main flow which is executed by the ticket examining controller 501 of the ticket examiner units 500 during the consumption of an electronic ticket. In this example of treating the consumption of the electronic ticket, it is assumed that a user previously purchases a ticket for admission into a concert hall, for example, and the electronic ticket which is

25

saved in his account is to be examined during its use. Accordingly, in this example, the ticket examiner unit performs an examination of a particular variety of electronic ticket, which is a concert admission ticket.

- Step 4001: The ticket examining controller 502 (Fig. 4B) waits for the
5 portable processor (IC card) to be inserted into the junction 503.
- Step 4002: When the portable processor is inserted, a connection between the ticket examiner unit and the account unit of the user is made according to the connection procedure between the terminal and the account unit which has been mentioned in connection with Fig. 12.
- 10 Step 4003: A ticket examining treatment is demanded to the electronic ticket processor 501 within the ticket examiner unit.
- Step 4004: A certificate of consumption is received from the account unit 210 of the user.
- Step 4005: The certificate of consumption is transmitted to the portable
15 processor 400, demanding a signature to the certificate of consumption.
- Step 4006: The certificate of consumption with signature is received from the portable processor 400, and is transmitted to the electronic ticket processor 501 within the ticket examiner unit 500.
- Step 4007: The ticket examining controller 502 receives a result of the ticket
20 examining treatment performed by the electronic ticket processor 501.
- Step 4008: The ticket examining controller demands the junction 503 to eject the portable processor.

Fig. 23 shows a flow executed by the electronic ticket processor 501 of the ticket examiner units 500 during the consumption.

- 25 Step 4100: A demand for the ticket examination (step 4003 in Fig. 22) is received from the ticket examining controller 502 to begin the treatment.
- Step 4101: The certificate of ticket examiner inscription of the ticket

examiner unit is transmitted to the account unit 210 of the user which is already connected in order to have the identity of the ticket examiner confirmed by the account unit 210 of the user.

5 Step 4102: A result of verification is received from the account unit 210 of the user.

Step 4103: A decision is rendered upon the result of verification, and if the result of verification indicates that it is not proper, the treatment is terminated.

Step 4104: If the result of verification indicates that it is proper, the ticket examining condition is presented to the account unit 210.

10 Step 4105: The ticket body being examined which complies with the condition is transmitted from the account unit 210, and thus is received.

Step 4106: The validity of the received ticket is verified.

15 Step 4107: The consuming circulation condition (indicating whether or not this user is entitled to use) which is described on the electronic ticket body is verified.

Step 4108: A result of verification is communicated to the account unit 210.

Step 4109: A decision is rendered upon the result of verification.

Step 4110: If the circulation condition is not complied with, an exception event is raised, and the treatment is terminated.

20 Step 4111: A certificate of consumption is received from the account unit 210.

Step 4112: The certificate of consumption is transmitted to the ticket examining controller 502, demanding a signature thereto.

Step 4113: The certificate of consumption with signature is received from the ticket examining controller 502, and its validity is verified.

25 Step 4114: A decision is rendered upon the result of verification.

Step 4115: If the result of verification indicates that it is not proper, an exception event is raised, and the treatment is terminated.

Step 4116: If the result of verification indicates that it is proper, a result of examining the ticket is transmitted to a service offering arrangement, such as an entrance gate unit or a shop-front POS terminal, for example.

Step 4117: The electronic ticket and the certificate of consumption with
5 signature are saved.

In rendering a decision during the examination of the ticket, it is possible to register the ticket ID of a used electronic ticket with a database to detect any electronic ticket which undergoes a double use, thus preventing such double use. It is also possible to use Distributed Digital Ticket
10 Management for Rights Trading System (an original text managing system described in ACM Conference on Electronic Commerce, 1999, pp 110-118 and referred to as a token manager) may be used in combination to prevent the double use. If these measures are not taken, a series of certificates of transfer of a used electronic ticket may be analyzed to identify a person who
15 has committed a multiple transfer or a multiple use, thereby taking an ex post facto measure as by punishing him.

Fig. 24 shows a main flow of the electronic ticket processor of the account unit of the consumer (user) side during the consumption.

Step 4201: Upon initiating the treatment, a certificate of inscription for the
20 ticket examiner unit is transmitted, and thus is received.

Step 4202: The certificate of inscription is verified and also the identity is verified.

Step 4203: A result of verification is transmitted.

Step 4204: A decision is rendered upon the result of verification.

25 Step 4205: If anything wrong is found, an exception event is raised and the treatment is terminated.

Step 4206: The ticket examining condition is transmitted from the ticket

examiner unit, and thus is received.

Step 4207: A ticket which complies with the ticket examining condition is retrieved.

Step 4208: The circulation condition on the packet examining side which is
5 described on the ticket (indicating if the ticket examiner unit is entitled to accept the ticket) is verified.

Step 4209: A decision is rendered upon the result of verification.

Step 4210: If the circulation condition is not complied with, an exception event is raised and the treatment is terminated.

10 Step 4211: If the circulation condition is complied with, the ticket body is transmitted to the ticket examiner unit.

Step 4212: A result of verifying the circulation condition on the ticket examining side is received.

Step 4213: A certificate of consumption is prepared.

15 Step 4214: The certificate of consumption is transmitted to the ticket examiner unit, thus proving that the ticket has been consumed.

Routine flows

Various routines in each of the flows mentioned above are described below.

20 Fig. 25 shows a flow for verifying the validity of an electronic ticket.

Step 5101: The structure of a ticket is initially verified.

Step 5102: A decision is rendered upon the result of verification.

Step 5103: If the result of verification indicates that the ticket is not proper, an exception event is raised and the treatment is terminated.

25 Step 5104: If the ticket is proper, then follows a verification of the signature using an public key obtained from the flow of Fig. 26 which will be described later, whereupon the treatment is terminated. However, it is assumed that a

key required to verify the signature on the certificate of inscription is already in possession.

Fig. 26 shows a flow of verifying a certificate of inscription such as a certificate of user inscription shown in Fig. 9 or a certificate of examiner inscription shown in Fig. 10.

Step 5201: The validity of a certificate of inscription is verified, as an electronic ticket, according to the flow of Fig. 25.

Step 5202: A decision is rendered upon the result of verification.

Step 5203: If the result of verification is failing, an exception event is raised and the treatment is terminated.

Step 5204: If the result of verification indicates the proper certificate, the public key stated on the certificate of inscription is saved as the public key for the user ID.

Fig. 27A shows a flow of verifying a circulation condition. This processing is implemented, for example, in step 2307 of Fig. 15, step 2504 of Fig. 17, step 3207 of Fig. 20, step 3304 of Fig. 21, step 4107 of Fig. 23 and step 4208 of Fig. 24, where it is examined if the side who is to receive an electronic ticket is qualified to receive or if the side who is to transmit an electronic ticket is qualified to transmit.

Step 5501: A circulation condition which is described on an electronic ticket is read out.

Step 5502: The ticket on which the condition is described is examined in accordance with the processing flow of Fig. 27B.

Step 5503: The validity of the acquired certificate of inscription is verified, as an electronic ticket, according to the flow of Fig. 25.

Step 5504: A verification is made to see if the owner ID on the acquired certificate of inscription coincides with the owner ID of the electronic ticket.

Fig. 27B shows a flow of the certificate of inscription examination on the examiner side at step 5502 of Fig. 27A.

Step 5601: The schema ID of the certificate of inscription to be examined as an electronic ticket is presented to the side being examined.

5 Step 5602: The examiner side receives a result of retrieval from the side being examined.

Step 5603: If a certificate of inscription has been received, it is checked if the schema ID of the certificate of inscription to be examined as an electronic ticket agrees with that of the certificate of inscription received.

10 Step 5604: Decide the result of check and if the result is proper, the processing is then completed.

Step 5605: If the result of check is not proper, an exception event is raised and the processing is terminated.

Fig. 28 shows a flow of the certificate of inscription examination on the side being examined in response to demand for certificate of inscription in the processing on the examiner side shown in Fig. 27B.

Step 5701: The side being examined retrieves a certificate of inscription which meets the schema ID received from the examiner side.

20 Step 5702: As a result of a retrieval, if it is found that there exists a certificate of inscription which meets the schema ID, the certificate of inscription is transmitted to the examiner side, and if such certificate of inscription does not exist, a reply to this effect is transmitted to the examiner side.

Modification

In the described embodiment, an electronic ticket is stowed in an account unit on a network. However, an electronic ticket stowed in an equivalent account unit may be downloaded into a portable account unit, and the account unit in which the electronic ticket is stowed may be physically

carried by a user together with a portable processor, whereby the ticket examination may be performed in exactly the same manner as in the present embodiment for an off-line ticket examiner unit which is not provided with an equipment for connection with an account unit on the network, by allowing
5 the portable account unit to be connected when the ticket examination is to be made. In this instance, the account unit and the portable processor may be located within one physical unit.

In the described embodiment, a certificate of account address and a certificate of user inscription are separate from each other. However, the
10 certificate of account address may function as a certificate of user inscription by containing a description of a public key which is necessary to verify the signature on the certificate of transfer or consumption with signature, thus allowing the examination of the certificate of user inscription to be omitted. Conversely, the certificate of user inscription may function as the certificate
15 of account address and may contain a description that it retains a certificate of a particular account address as a circulation condition for the electronic ticket which is to be circulated, thus allowing the verification of the circulation condition to be achieved through the verification of the certificate of account address.

20 In the described embodiment, when the ticket examination is to be performed, the portable processor 400 is inserted into the ticket examiner units 500 for a mechanical and an electrical connection therewith. However, the portable processor 400 may be adapted to achieve a connection with the communication network (internet 10), and thus be allowed to be connected
25 with the ticket examiner units 500 through the communication network for performing a consumption treatment for the electronic ticket. Alternatively, the portable processor 400 may be inserted into the user terminal unit 300 to

be connected with the ticket examiner units 500 through the communication network, which is enabled by the user terminal unit 300, thus performing a ticket examining treatment (consumption treatment) for the electronic ticket.

In the embodiment described above, the certificate of consumption for
5 the electronic ticket is prepared (at step 4213 in Fig. 24) by the user account unit 210 during the consumption treatment. However, the certificate of consumption may be prepared by the ticket examiner units 500.

Alternatively, where the portable processor 400 is inserted into the user terminal unit 300 and then connected through the communication network
10 with the ticket examiner unit for purpose of consumption treatment, it may be prepared by the user terminal unit.

EFFECT OF THE INVENTION

According to the present invention, each user saves an electronic
15 ticket in a storage provided in an account unit in an account managing center, which is independent from an electronic ticket issuing organization (issuer), and accesses the account unit to derive a required electronic ticket when the electronic ticket is to be used (to be transferred or consumed). Accordingly, there is no need for a portable processor which is used by the user to retain an
20 electronic ticket, thus allowing a variety of electronic tickets from different issuing organizations to be saved in large quantities and to be used.

In principle, each account address is accessible by any user, whereby an electronic ticket can be unilaterally transferred or issued to the account address of any transferee at any time.

25 Each ticket examiner unit can access an account unit on the network and thus the user is not required to stow the electronic ticket body in his portable processor, but can access his account unit through the ticket

The account unit is not associated with the key, but the portable processor has the signature function so that when transferring and consuming, a signature is attached to the certificate of transfer or consumption by way of the portable processor. Accordingly, if one has successively impersonated himself as a transferee to obtain an electronic ticket, he cannot attach a genuine signature to the certificate of transfer or consumption, and thus is prevented from using the electronic ticket which is illicitly obtained.

WHAT IS CLAIMED IS:

1. A method of processing an issuance of electronic rights information in a rights information processing system in which a user terminal unit, an issuer unit, and an account unit are interconnected on a communication network, comprising the steps of:

- (a) transmitting an account address and a demand for issuance from a user terminal unit to an issuer unit;
- (b) causing the issuer unit to transmit the demand for issuance to an account unit which corresponds to the account address;
- (c) to obtain a user identifier from the account unit;
- (d) to prepare electronic rights information inclusive of the user identifier;
- (e) and to transmit the electronic rights information to the account unit;
- and
- (f) causing the account unit to store the electronic rights information in a storage.

2. A method according to Claim 1 in which the step (d) comprises the steps of

- (d-1) causing the issuer unit to access the account address of the user upon receiving the demand for issuance;
- (d-2) causing the accessed account unit to transmit a certificate of account address which guarantees a correspondence relationship between the account address assigned to the user and an identifier of the user of the account unit to the issuer unit; and
- (d-3) causing the issuer unit to verify the certificate of account address and allowing it to use the identifier of the user contained in the certificate of

account address as the user identifier upon successful verification.

3. A method of processing a consumption treatment of electronic rights information in a rights information processing system in which a user terminal unit, an account unit and a ticket examiner unit are interconnected on a communication network, comprising the steps of:

- (a) transmitting an account address which is derived from a portable processor to a ticket examiner unit;
- (b) causing the ticket examiner unit to be connected with an account unit at the account address to demand necessary electronic rights information;
- (c) causing the account unit to derive the demanded electronic rights information and to transmit it to the ticket examiner unit; and
- (d) causing the ticket examiner unit to verify the electronic rights information to render a decision whether a ticket examination is to be enabled or disabled.

4. A method according to Claim 3 in which the step (d) comprises;

- (d-1) demanding the portable processor to generate a signature to a certificate of consumption,
- (d-2) causing the portable processor to generate the signature and to transmit to the ticket examiner unit, and
- (d-3) causing the ticket examiner unit to verify the signature.

5. A method according to Claim 3 in which the step (c) comprises the steps of verifying a circulation condition on the ticket examining side for the derived electronic rights information, and transmitting it to the ticket examiner unit upon successful verification.

6. A method according to Claim 3, 4 or 5 in which the step (d) comprises verifying a circulation condition on the user side for the received electronic rights information, and using a result of such verification in rendering a decision to enable or disable the ticket examination.

7. A method of processing a transfer treatment of electronic rights information in a rights information processing system in which a user terminal unit and an account unit are connected together on a communication network, comprising the steps of:

- (a) causing a user terminal unit to transmit a demand for transfer inclusive of an identifier of electronic rights information and a transferee address to an account unit of a transferer;
- (b) causing the account unit of the transferer to transmit the electronic rights information to an account unit at the transferee address; and
- (c) causing the account unit of the transferee to store the electronic rights information in the account unit of the transferee.

8. A method according to Claim 7 in which the step (b) comprises the steps of;

(b-1) when the account unit of the transferer accesses the account unit of the transferee, causing the account unit of the transferee to transmit a certificate of account address which guarantees a correspondence relationship between the account address and an identifier of a user of the account unit to the user terminal unit through the account unit of the transferer;

(b-2) causing the user terminal unit to verify the certificate of account address and to transmit a result of such verification to the account unit of the transferer; and

(b-3) causing the account unit of the transferer to transmit the electronic rights information upon finding that the received result of verification is acceptable.

9. A method according to Claim 7 or 8 in which the step (a) comprises the steps of:

- (a-1) when a portable processor is loaded into the user terminal unit,

(d-2-3) causing the user terminal unit to transmit the certificate of

transfer with signature to the account unit of the transferee through the account unit of the transferer.

12. An account unit used in rights information processing system in which a user terminal unit, an issuer unit and a ticket examiner unit are interconnected on a communication network; comprising

communicating means which is accessed at a specific account address;

storage means for storing electronic rights information;

receiving processor means for processing at least one of a transfer treatment and issue treatment of electronic rights information;

consumption processor means for processing a consumption treatment of electronic rights information.

13. An account unit according to Claim 12 in which the receiving processor means comprises means responsive to a demand for transfer to transmit a certificate of account address which guarantees a correspondence relationship between the account address of an account unit and an identifier of a user of the account unit to the accessing side issuer unit, means for receiving electronic rights information from an issuer unit, and means for storing the received electronic rights information in said storage means.

14. An account unit according to Claim 12 or 13 in which the consumption processor means comprises means responsive to a presented ticket examining condition to retrieve and derive electronic rights information which conforms to the ticket examining condition from the storage means, means for verifying the circulation condition for the derived electronic rights information, and means for transmitting the electronic rights information to the ticket examiner unit upon successful verification.

15. An account unit according to Claim 12 or 13, further comprising transfer processor means which comprises means for accessing an account

unit at a transferee address upon receiving an identifier of electronic rights information, a transferee address and a demand for transfer from a user terminal unit, means for transmitting the electronic rights information to the account unit of the transferee upon receiving a notice of successful verification from the user terminal unit indicating the validity of the account unit at the transferee address, and means for preparing a certificate of transfer with signature which indicates that the electronic rights information is transferred to the transferee and for transmitting it to the account unit of the transferee.

16. A user terminal unit in rights information processing system in which a user terminal unit, an issuer unit and an account unit are interconnected on a communication network, comprising

means for receiving a user account address and adapted to be connected to an account unit which is specified by the account address;

means for demanding a transfer by transmitting an identifier of electronic rights information and an account address of a transferee to the account unit during a transfer treatment of electronic rights information; and

verifying means for verifying a certificate of account address which is transmitted from the account unit of the transferer and comparing the account address indicated on the certificate of account address and the account address of the transferee which has been transmitted for coincidence.

17. A user terminal unit according to Claim 16, further comprising means for demanding a loaded portable processor to generate a signature to a certificate of transfer, for verifying a certificate of transfer with signature thus obtained and for transmitting it to the account unit of the transferee through the account unit of the transferer.

18. A ticket examiner unit in rights information processing system in

which a user terminal unit, a ticket examiner unit and an account unit are interconnected on a communication network, comprising

means for receiving a user identification information and an account address from a loaded portable processor for connection with an account unit which is specified by the account address;

means for demanding electronic rights information which is to be examined from the account unit, verifying the received electronic rights information and transmitting a result of verifying to the account unit; and

means for demanding the portable processor to make a signature to the certificate of consumption and for verifying the signature thus obtained.

19. Rights information processing system in which a user terminal unit, an issuer unit and an account unit are interconnected on a communication network, comprising

a plurality of account units connected to the communication network and accessed by an account address which is assigned to each user for managing the electronic rights information of a user, each account unit including a storage for storing the electronic rights information of the user, and

terminal means connected to the communication network for accessing the account unit by means of the account address of the user to present a demand for treatment which is either transfer or consumption of the electronic rights information.

20. Electronic rights information processing system according to Claim 19, further comprising a portable processor physically carried by each user to be detachably loaded in the terminal means, said portable processor holding the account address and the identification information of the user and comprises means for generating a signature of the user.

21. Electronic rights information processing system according to Claim 20 in which the terminal means includes a plurality of user terminal units, each of the user terminal units including means for presenting a demand for transfer treatment by entering and transmitting to the account unit of the transferer an identifier of the user, an identifier indicating the electronic rights information to be transferred and an account address of a transferee during a transfer treatment,

the account unit of the transferer including means for demanding a certificate of account address from an account unit at an account address of the transferee, for transmitting the certificate of account address which is received from the account unit of the transferee to the user terminal unit and transmitting the electronic rights information to the account unit of the transferee upon receiving a successful result of verification from the user terminal unit,

the account unit of the transferee including means for storing the electronic rights information.

22. Electronic rights information processing system according to Claim 21 in which the account unit of the transferer includes means for demanding a certificate of transfer to the user terminal unit, and means for transmitting the certificate of transfer with signature which is received from the user terminal unit to the account unit of the transferee,

the user terminal unit including means for preparing the certificate of transfer with signature and for transmitting the certificate of transfer with signature which is thus obtained to the account unit of the transferee through the account unit of the transferer,

the account unit of the transferee including means for retaining the certificate of transfer with signature which is received from the account unit

of the transferer.

23. Electronic rights information processing system according to Claim 20 in which the terminal means comprises a plurality of ticket examiner units, each of the ticket examiner units including means for transmitting an identifier indicating electronic rights information which is to be examined to the account unit of the user to demand electronic rights information, and means for verifying electronic rights information which is received from the account unit of the user, for demanding the portable processor to generate a signature to the certificate of consumption upon successful verification and for verifying the signature which is received from the portable processor to render a decision to enable or disable a ticket examination.

24. A recorded medium having a program recorded therein which is used to execute a method of processing electronic rights information in an account unit of rights information processing system in which a user terminal unit, an issuer unit, a ticket examiner unit and an account unit are interconnected on a communication network, the program comprising the steps of:

- (a) receiving an access at an account address;
- (b) transmitting a certificate of account address which guarantees a correspondence relationship between a particular account address and an identifier of a user of a corresponding account unit to an accessor;
- (c) receiving electronic rights information from the accessor; and
- (d) storing the electronic rights information in storage means.

25. A recorded medium according to Claim 24, the program further comprising the steps of:

- (f) receiving a ticket examining condition from a ticket examiner

unit;

(g) retrieving and deriving electronic rights information which is subject to the ticket examining condition from the storage means; and

(h) transmitting the electronic rights information to the ticket examiner unit.

26. A recorded medium having a program recorded therein which is used to execute a method of processing electronic rights information in a ticket examiner unit of rights information processing system in which a user terminal unit, a ticket examiner unit and an account unit are interconnected on a communication network, the program comprising the steps of:

(a) receiving a user identification information and an account address from a loaded portable processor;

(b) achieving a connection with an account unit which is specified by the account address;

(c) demanding electronic rights information which is to be ticket examined from the account unit;

(d) verifying the received electronic rights information and transmitting a result of verification to the account unit; and

(e) demanding the portable processor to generate the signature to certificate of consumption and verifying the signature which is thus obtained.

ABSTRACT OF THE DISCLOSURE

A transferer terminal accesses its account (of the transferer) to receive a list of electronic tickets contained in his account, selects a ticket which is to be transferred, transmits that electronic ticket, an account address of a transferee and a demand for transfer to the account, which in turn accesses an account of a transferee to receive an account address certificate, which is then verified by a terminal. A result of verification is transmitted to the account of transferer, whereby the electronic ticket is transmitted from the account of the transferer to the account the transferee. The account of the transferee verifies the received electronic ticket, and upon successful verification, it transmits such result to the account of the transferer, which then demands a certificate of transfer with signature from the transferer terminal. The transferer terminal demands a signature to be attached to the certificate of transfer from a portable processor. The certificate of transfer with signature which is thus obtained is then transmitted to the account of the transferer, which then transmits it to the account of the transferee. The account of the transferee retains the received certificate of transfer with signature together with the electronic ticket.

FIG. 2A

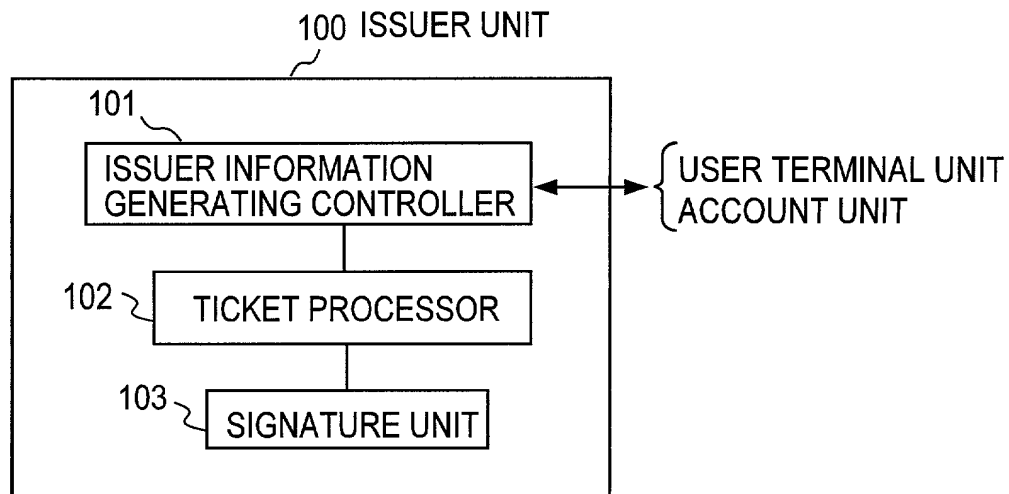


FIG. 2B

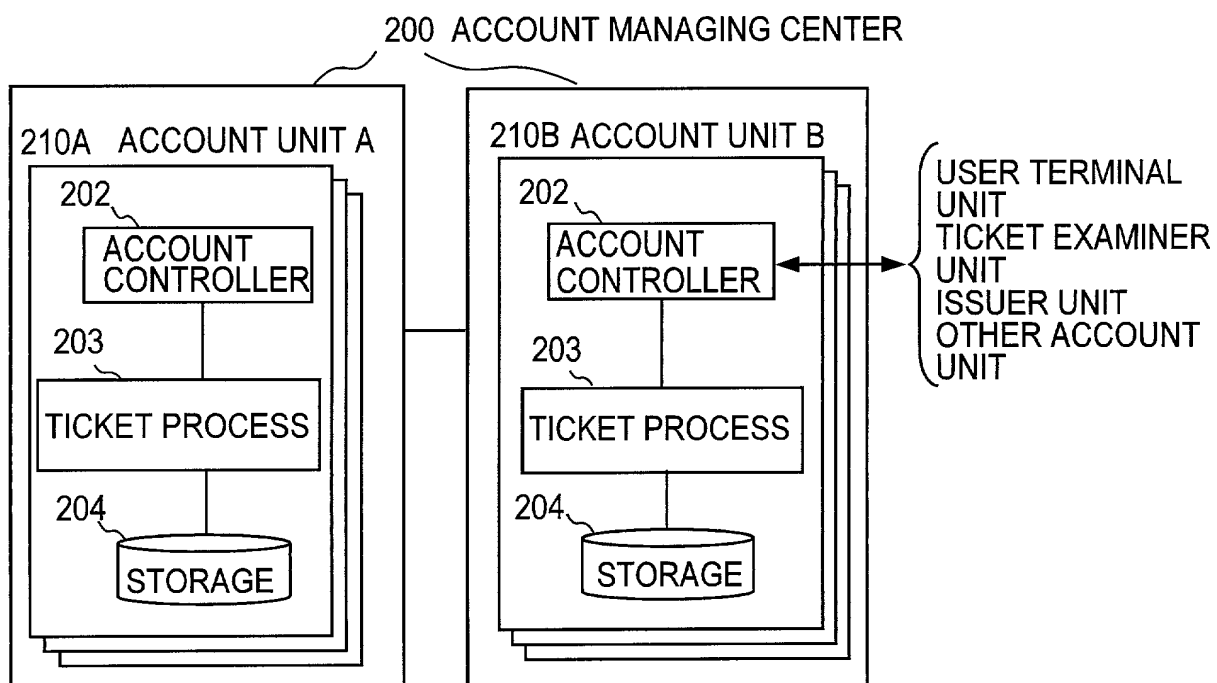


FIG. 3A

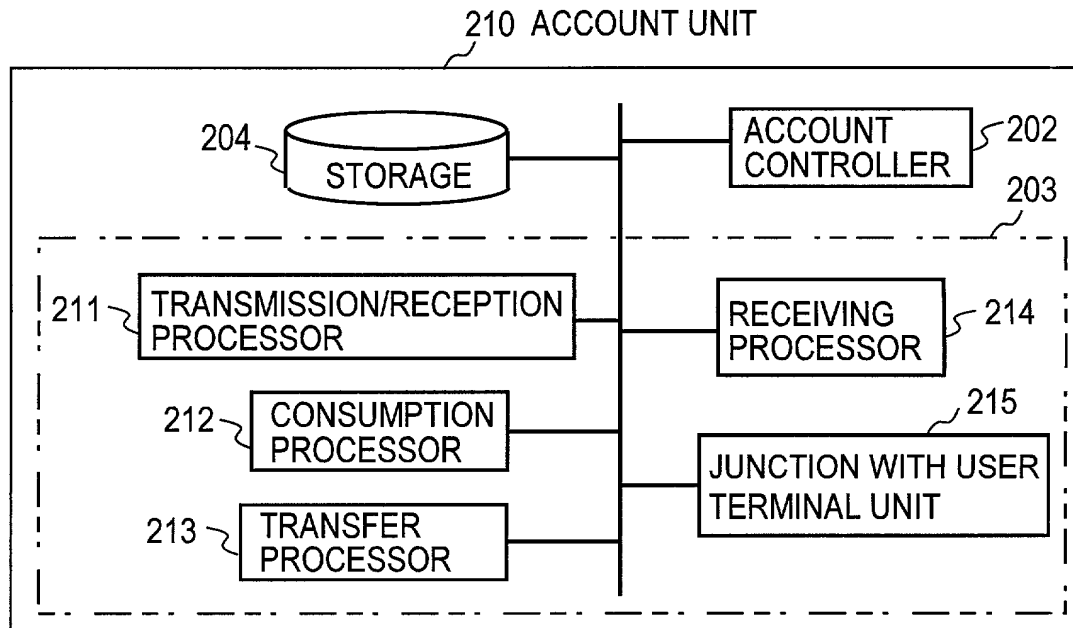


FIG. 3B

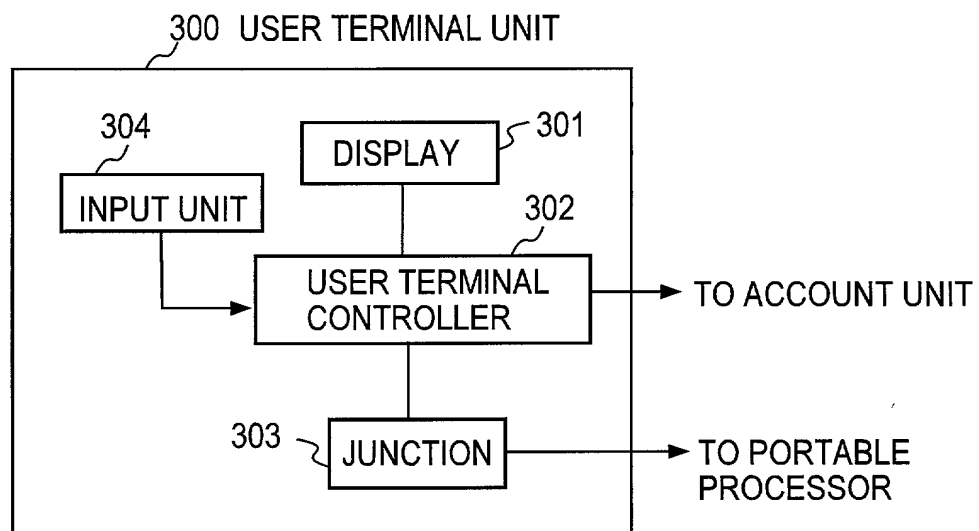


FIG. 4A

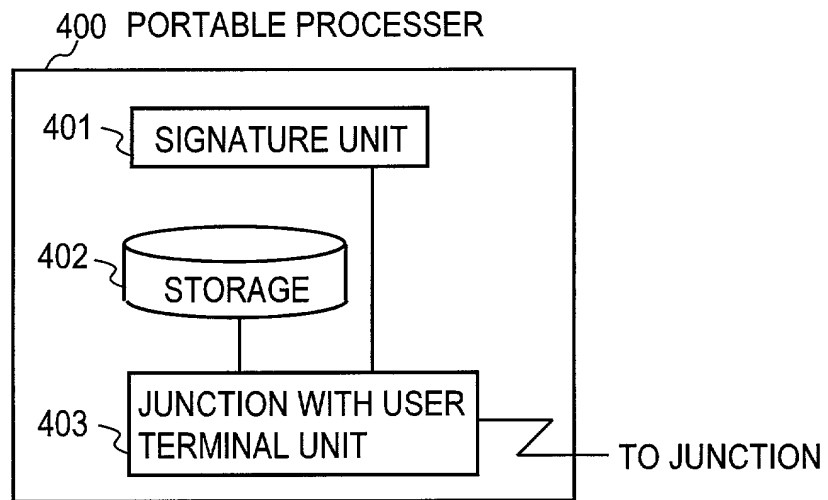


FIG. 4B

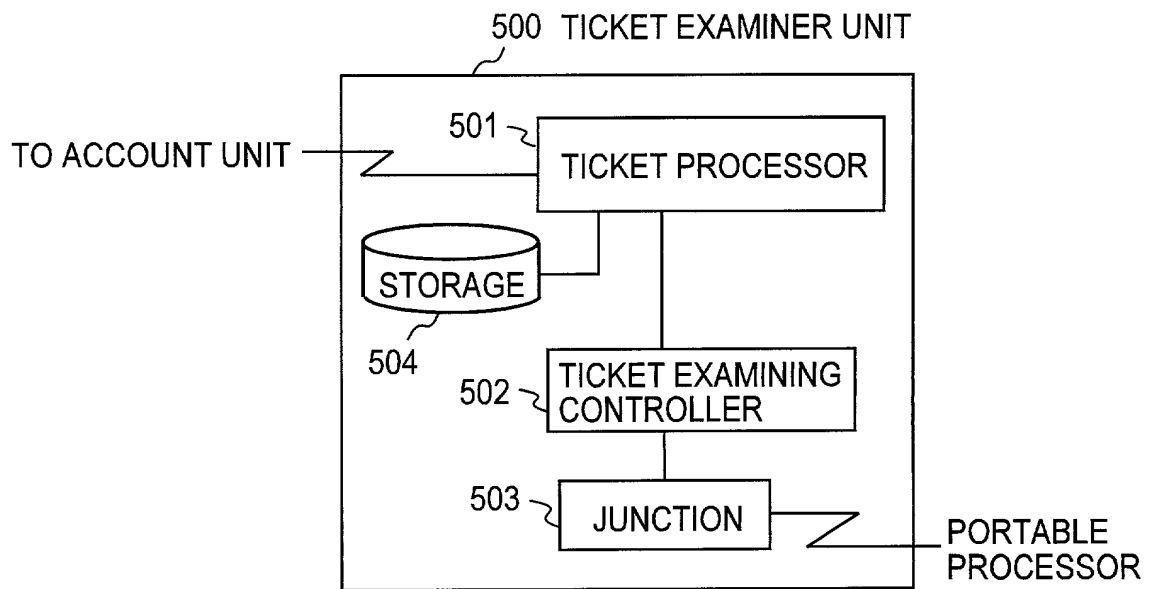


FIG. 5

60A ELECTRONIC TICKET

ATTRIBUTE		VALUE(EXAMPLE)	
SCHEMA ID		http://digitalticket.net/concert	601
TICKET ID		000234	602
ISSUER ID		Daspw6Oms21wmfsd3	603
VARIETY OF RIGHTS		CONCERT TICKET	604
RIGHTS INFORMATION		ARTIST=ab-strom DATE=2000-03-01	610
620	ISSUING CONDITIONS	TRANSMITTER DEMAND TICKET SCHEMA ID	621
		RECEIVER DEMAND TICKET SCHEMA ID	622
630	TRANSFER CONDITIONS	TRANSFERABILITY	631
		TRANSMITTER DEMAND TICKET SCHEMA ID	632
		RECEIVER DEMAND TICKET SCHEMA ID	633
640	CONSUMPTION CONDITIONS	EFFECTIVE TIME LIMIT	641
		EFFECTIVE NUMBER OF TIMES	642
		TRANSMITTER DEMAND TICKET SCHEMA ID	643
		RECEIVER DEMAND TICKET SCHEMA ID	644
OWNER ID		E2W4usdhale05j4x92kld984	605
ISSUER SIGNATUER		Eplx3c012k0dlc8765jsp23d41d	606

FIG. 6

60B CERTIFICATE OF TRANSFER

ATTRIBUTE		VALUE(EXAMPLE)	
SCHEMA ID		#sys-transferred-cert	601
TICKET ID		000132349	602
CURRENT OWNER ID		E2W4usdhale05j4x92kld984	603
VARIETY OF RIGHTS		CERTIFICATE OF TRANSFER	604
RIGHTS INFORMATION		TRANSFER TICKET SCHEMA ID= http://digitalticket.net/concert TRANSFER TICKET ID=000234 DATE OF ISSUE=2000-02-28	610
620	ISSUING CONDITIONS	TRANSMITTER DEMAND TICKET SCHEMA ID	621
		RECEIVER DEMAND TICKET SCHEMA ID	622
630	TRANSFER CONDITIONS	TRANSFERABILITY	631
		TRANSMITTER DEMAND TICKET SCHEMA ID	632
		RECEIVER DEMAND TICKET SCHEMA ID	633
640	CONSUMPTION CONDITIONS	EFFECTIVE TIME LIMIT	641
		EFFECTIVE NUMBER OF TIMES	642
		TRANSMITTER DEMAND TICKET SCHEMA ID	643
		RECEIVER DEMAND TICKET SCHEMA ID	644
NEW OWNER ID		Fdfsdlp94if87i3kjdf83oqfstew	605
ISSUER SIGNATUER		Dsknei5498f3kxk03cdscjsurw	606

FIG. 7

60C CERTIFICATE OF CONSUMPTION

ATTRIBUTE		VALUE(EXAMPLE)	
SCHEMA ID		# sys-consumed-cert	601
TICKET ID		004239	602
ISSUER ID		Fdfsdlp94if87i3kjdf83oqfstew	603
VARIETY OF RIGHTS		CERTIFICATE OF CONSUMPTION	604
RIGHTS INFORMATION		CONSUMPTION TICKET SCHEMA ID= http://digitalticket.net/concert CONSUMPTION TICKET ID=000234 DATE OF ISSUE=2000-03-14	610
620	ISSUING CONDITIONS	TRANSMITTER DEMAND TICKET SCHEMA ID	621
		RECEIVER DEMAND TICKET SCHEMA ID	622
630	TRANSFER CONDITIONS	TRANSFERABILITY	631
		TRANSMITTER DEMAND TICKET SCHEMA ID	632
		RECEIVER DEMAND TICKET SCHEMA ID	633
640	CONSUMPTION CONDITIONS	EFFECTIVE TIME LIMIT	641
		EFFECTIVE NUMBER OF TIMES	642
		TRANSMITTER DEMAND TICKET SCHEMA ID	643
		RECEIVER DEMAND TICKET SCHEMA ID	644
OWNER ID			605
ISSUER SIGNATUER		Csknei5498f3kxk03cdscjsurw	606

FIG. 8A

60B CERTIFICATE OF TRANSFER

TICKET INFORMATION	OWNER ID (NEW OWNER)	ISSUER SIGNATURE(SIGNATURE OF CURRENT OWNER)
60B1	60B2	60B3

FIG. 8B

60C CERTIFICATE OF CONSUMPTION

TICKET INFORMATION	NULL	ISSUER SIGNATURE(SIGNATURE OF CURRENT OWNER)
60C1	60C2	60C3

FIG. 9

60D CERTIFICATE OF USER INSCRIPTION

ATTRIBUTE		VALUE(EXAMPLE)	
SCHEMA ID		http://digitalticket.net/user-reg-cert	601
TICKET ID		00023323	602
ISSUER ID		Hduebx94hf75nsght3kd9j	603
VARIETY OF RIGHTS		CERTIFICATE OF USER INSCRIPTION	604
RIGHTS INFORMATION		PUBLIC KEY OF USER owjidhf123u8n9nz98bwqjaolkanda	610
620	ISSUING CONDITIONS	TRANSMITTER DEMAND TICKET SCHEMA ID	621
		RECEIVER DEMAND TICKET SCHEMA ID	622
630	TRANSFER CONDITIONS	TRANSFERABILITY	NON-TRANSFERABLE 631
		TRANSMITTER DEMAND TICKET SCHEMA ID	632
		RECEIVER DEMAND TICKET SCHEMA ID	633
640	CONSUMPTION CONDITIONS	EFFECTIVE TIME LIMIT	2001-03-01 641
		EFFECTIVE NUMBER OF TIMES	642
		TRANSMITTER DEMAND TICKET SCHEMA ID	643
		RECEIVER DEMAND TICKET SCHEMA ID	644
OWNER ID		Kjsas0k2r2sd904jfslkvdfmso	605
ISSUER SIGNATUER		Fjsuiwhe7vfjle9jkdfuio9034j	606

FIG. 10

60E CERTIFICATE OF TICKET EXAMINER INSCRIPTION

ATTRIBUTE		VALUE(EXAMPLE)	
SCHEMA ID		http://digitalticket.net/user-reg-cert	601
TICKET ID		00023323	602
ISSUER ID		Hduebx94hf75nsght3kd9j	603
VARIETY OF RIGHTS		CERTIFICATE OF TICKET EXAMINER INSCRIPTION	604
RIGHTS INFORMATION		PUBLIC KEY OF TICKET EXAMINER 45lsJiQ34l9odr40KZsmJnqtMLUaH7	610
620	ISSUING CONDITIONS	TRANSMITTER DEMAND TICKET SCHEMA ID	621
		RECEIVER DEMAND TICKET SCHEMA ID	622
630	TRANSFER CONDITIONS	TRANSFERABILITY	631
		TRANSMITTER DEMAND TICKET SCHEMA ID	632
		RECEIVER DEMAND TICKET SCHEMA ID	633
640	CONSUMPTION CONDITIONS	EFFECTIVE TIME LIMIT	641
		EFFECTIVE NUMBER OF TIMES	642
		TRANSMITTER DEMAND TICKET SCHEMA ID	643
		RECEIVER DEMAND TICKET SCHEMA ID	644
OWNER ID		Kjsas0k2r2sd904jfslkvdfmso	605
ISSUER SIGNATUER		Fjsuiwhe7vfjle9jkdfuio9034j	606

FIG. 11

60F CERTIFICATE OF ACCOUNT ADDRESS

ATTRIBUTE		VALUE(EXAMPLE)	
SCHEMA ID		http://digitalticket.net/address-cert	601
TICKET ID		00023323	602
ISSUER ID		lujjnvhirj9467flmvjgdokd9472pfks	603
VARIETY OF RIGHTS		CERTIFICATE OF ACCOUNT ADDRESS	604
RIGHTS INFORMATION		account://ticket.matsuyama.net/	610
620	ISSUING CONDITIONS	TRANSMITTER DEMAND TICKET SCHEMA ID	621
		RECEIVER DEMAND TICKET SCHEMA ID	622
630	TRANSFER CONDITIONS	TRANSFERABILITY	631
		TRANSMITTER DEMAND TICKET SCHEMA ID	632
		RECEIVER DEMAND TICKET SCHEMA ID	633
640	CONSUMPTION CONDITIONS	EFFECTIVE TIME LIMIT	641
		EFFECTIVE NUMBER OF TIMES	642
		TRANSMITTER DEMAND TICKET SCHEMA ID	643
		RECEIVER DEMAND TICKET SCHEMA ID	644
OWNER ID		Kjsas0k2r2sd904jfslkvdfrmso	605
ISSUER SIGNATUER		J397eopcjos22fsffspda467fjh	606

FIG. 12

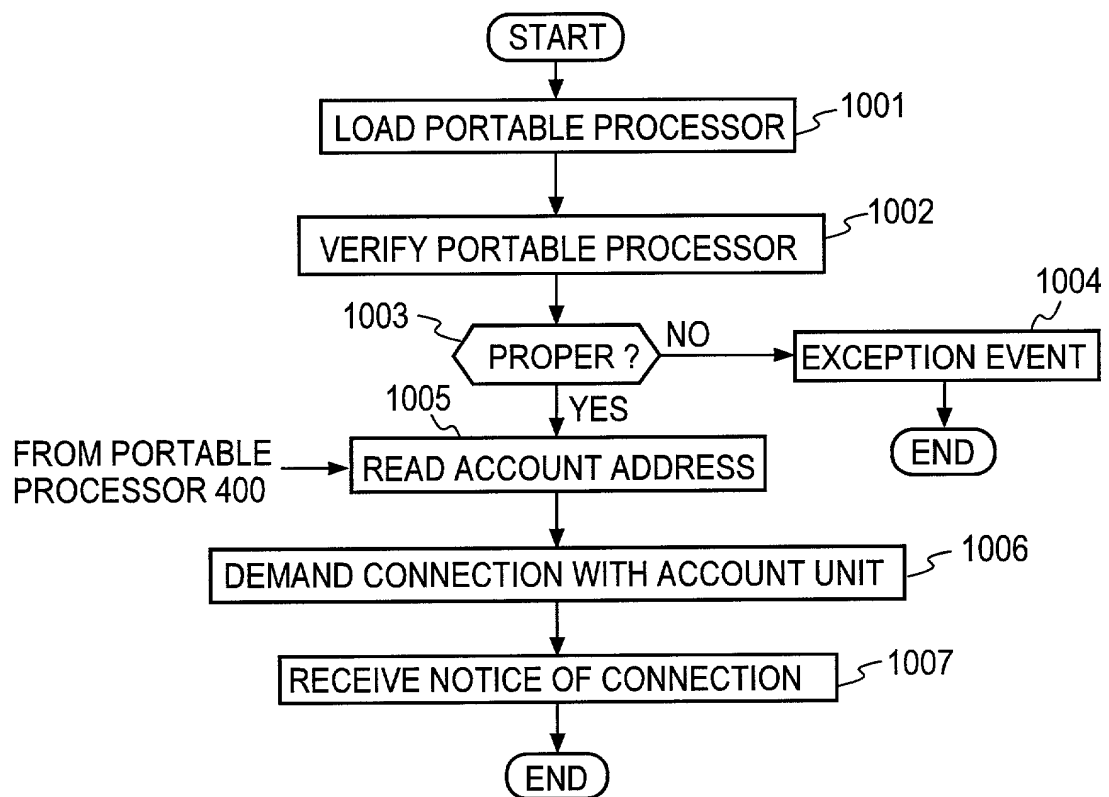


FIG. 13

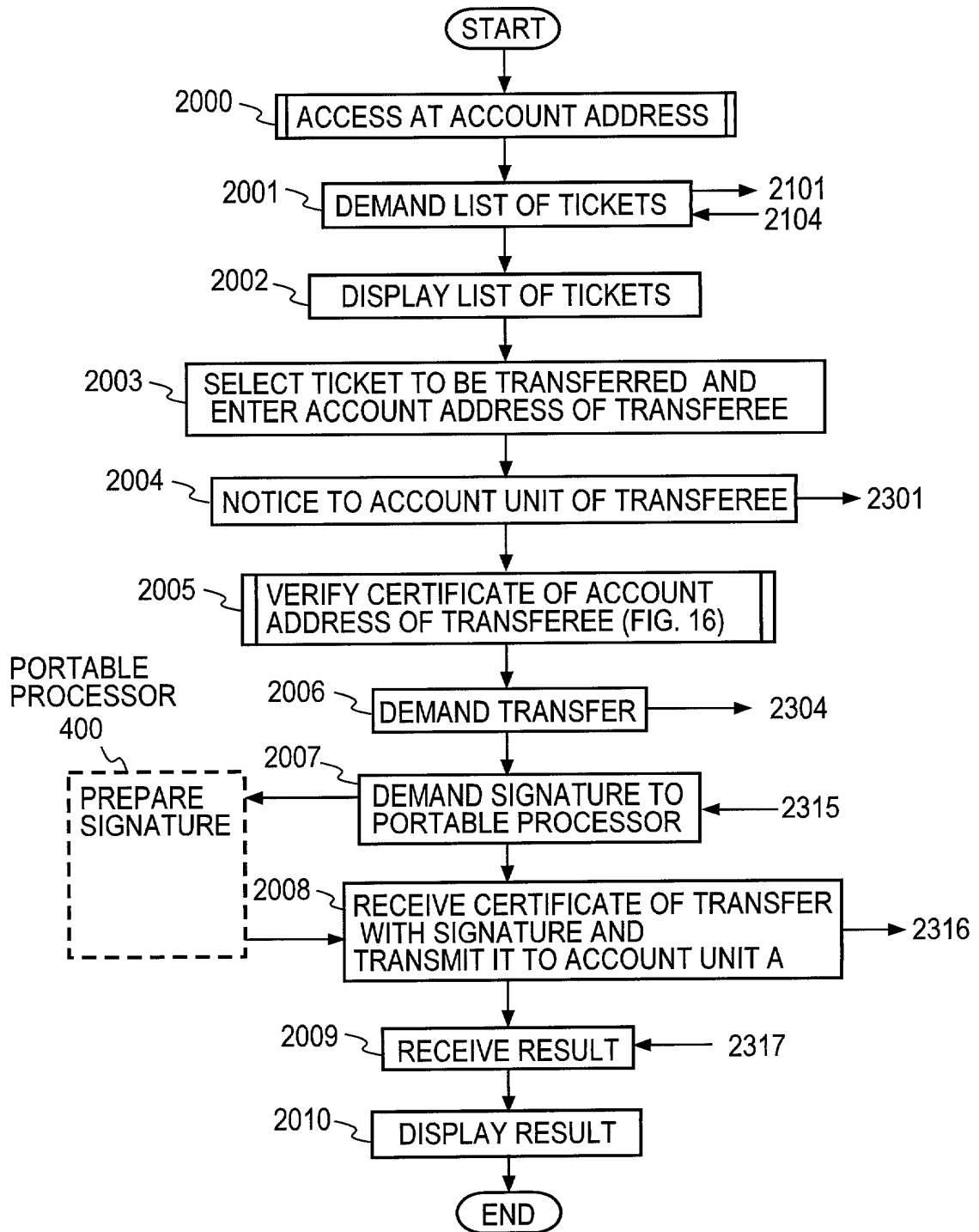


FIG. 14

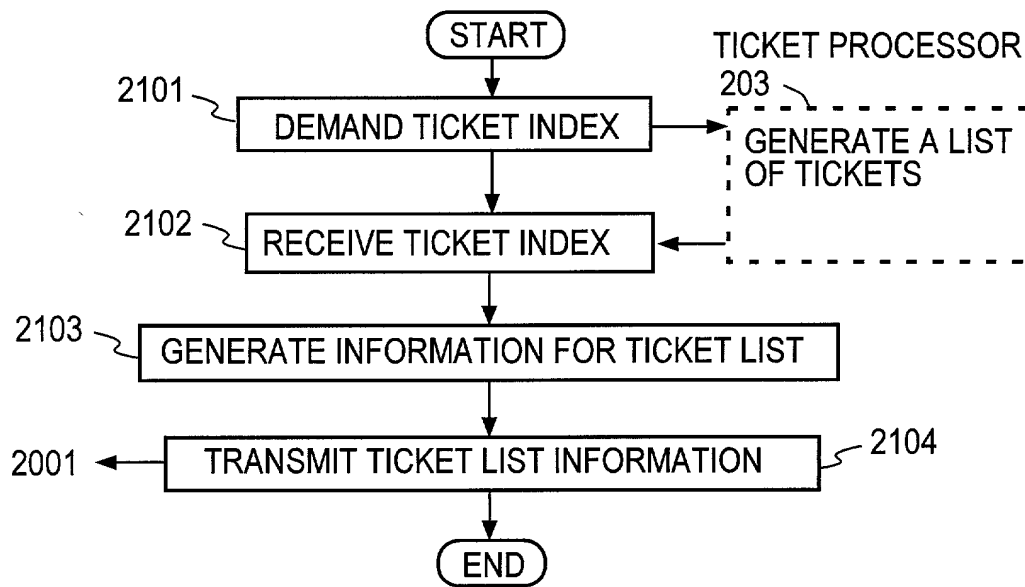


FIG. 15

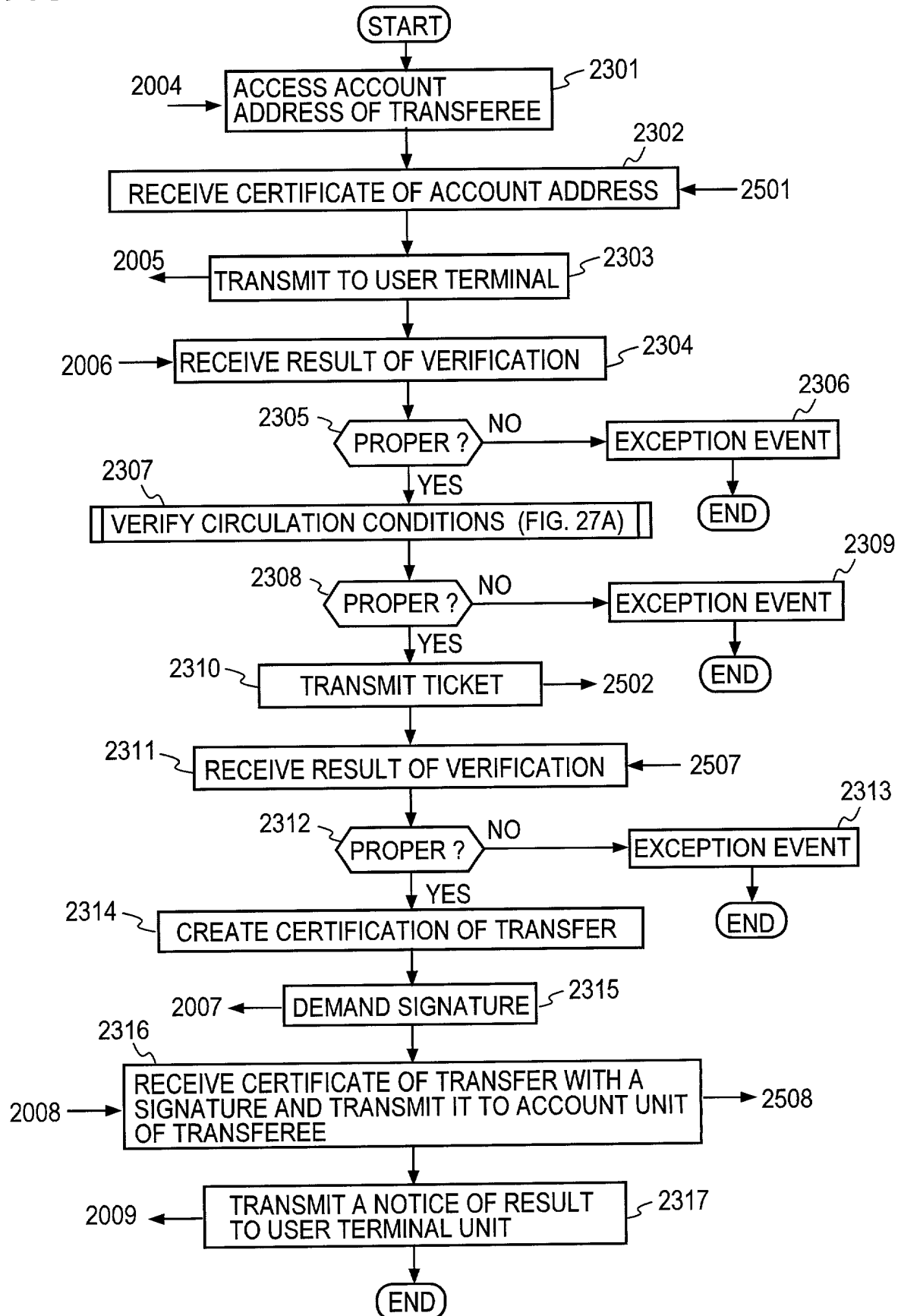


FIG. 16

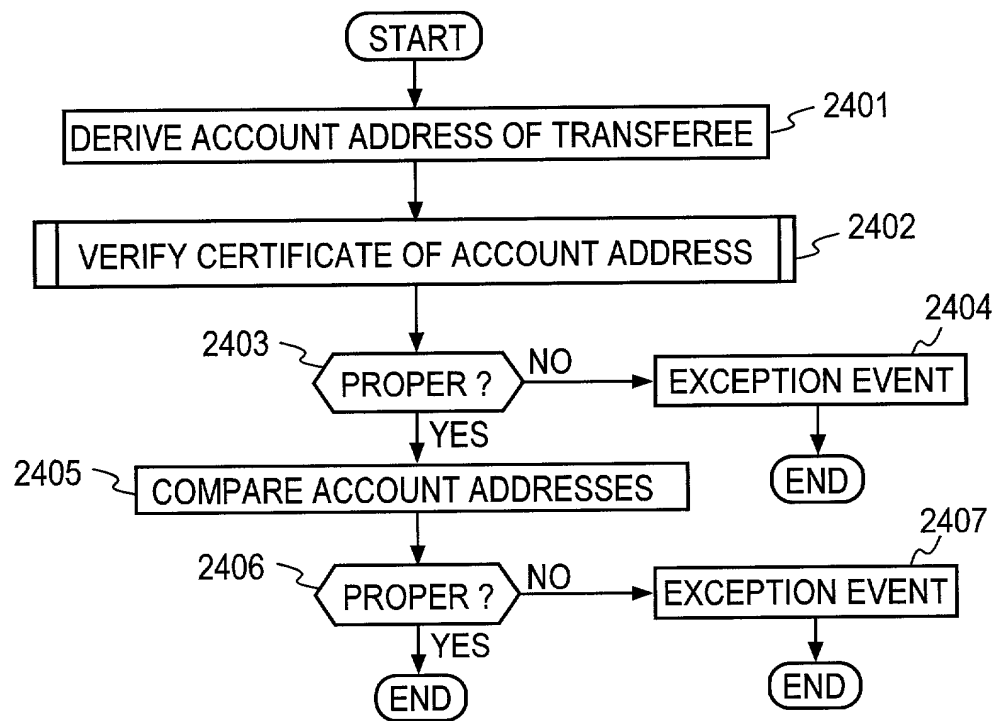


FIG. 17

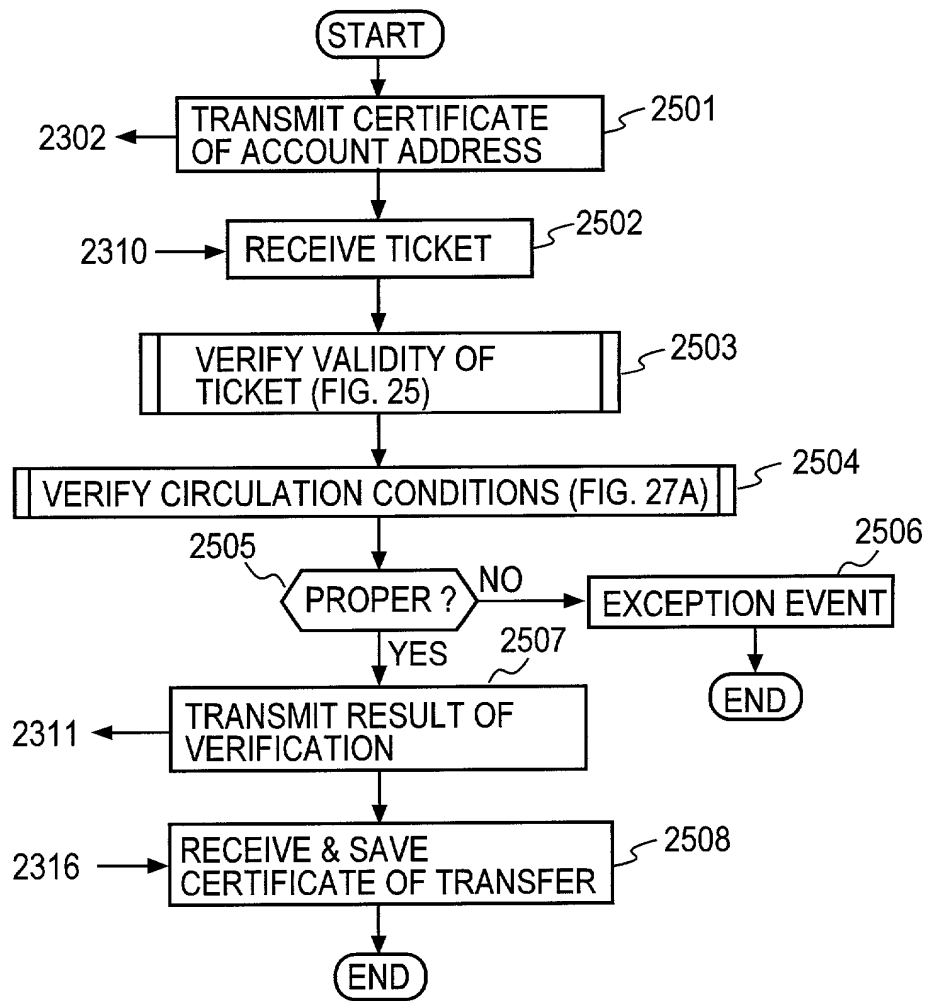


FIG. 18

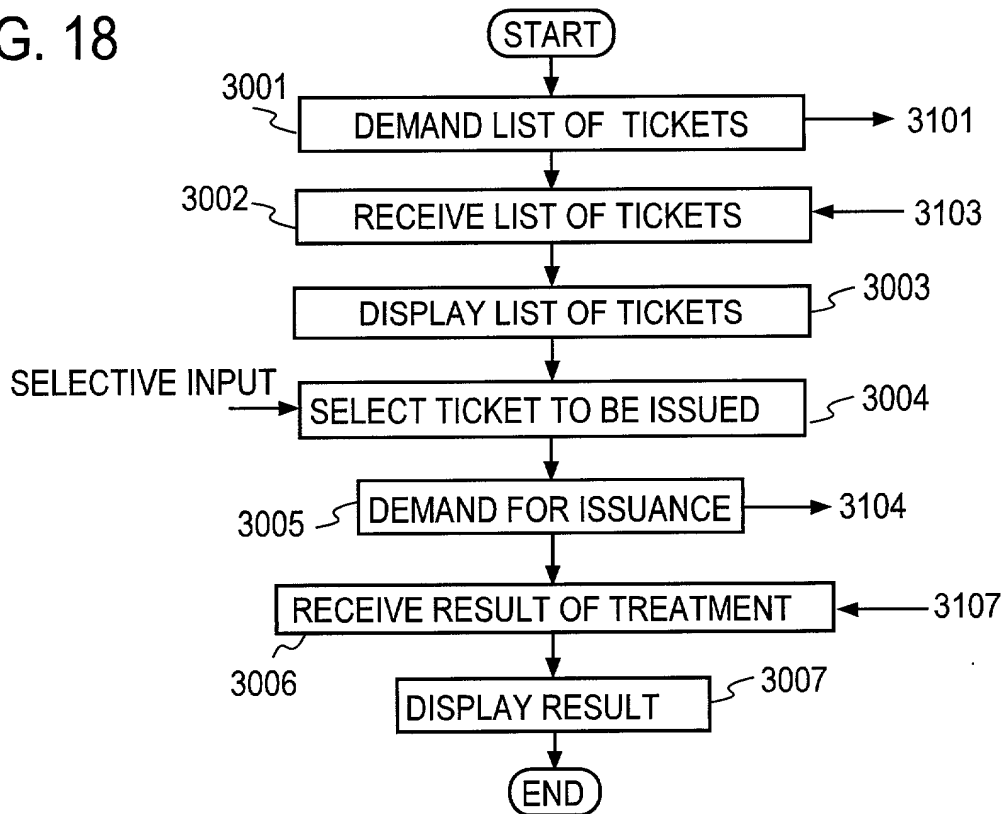


FIG. 19

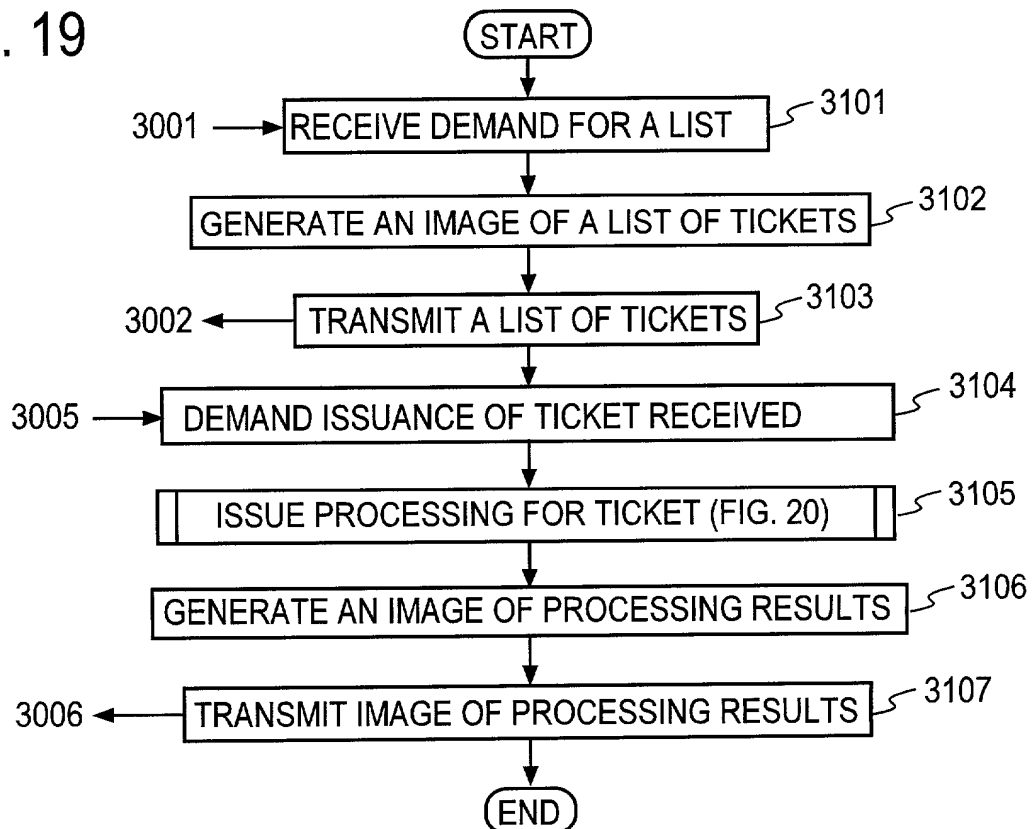


FIG. 20

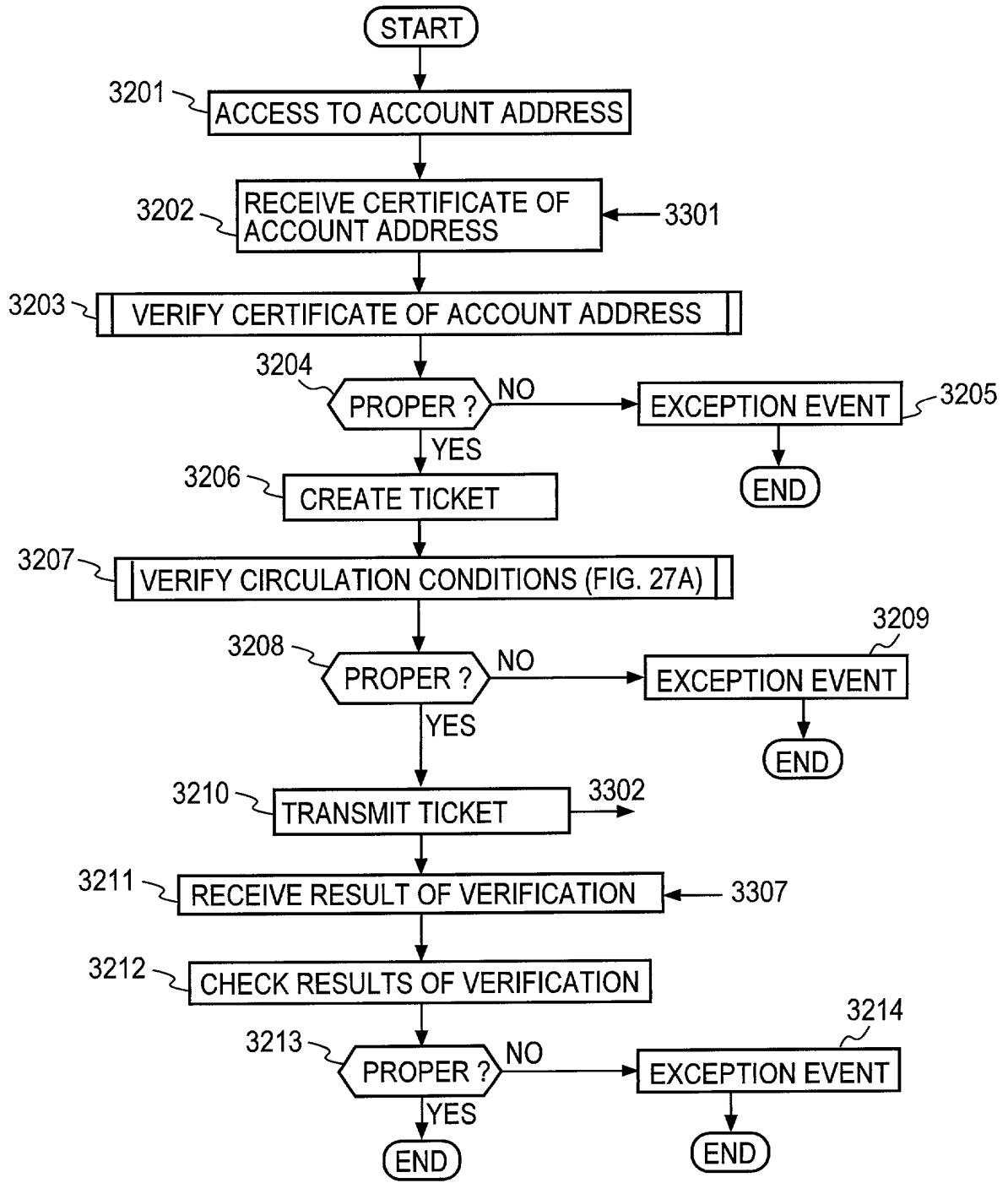


FIG. 21

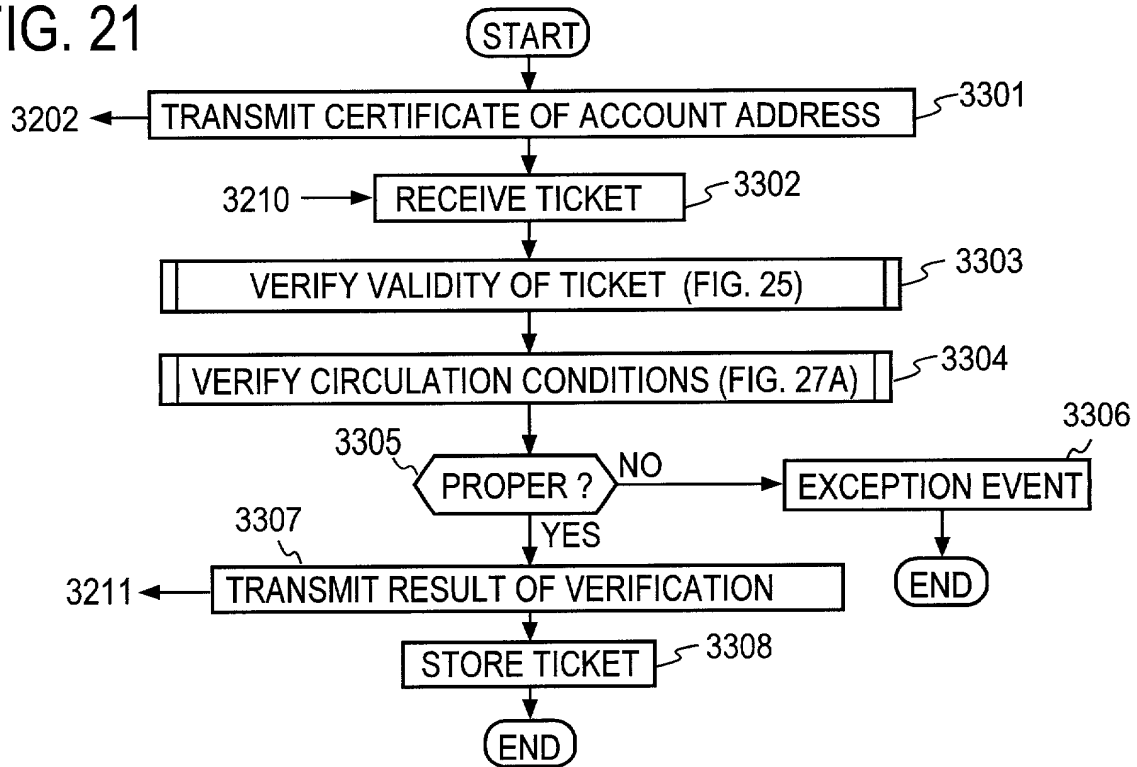


FIG. 22

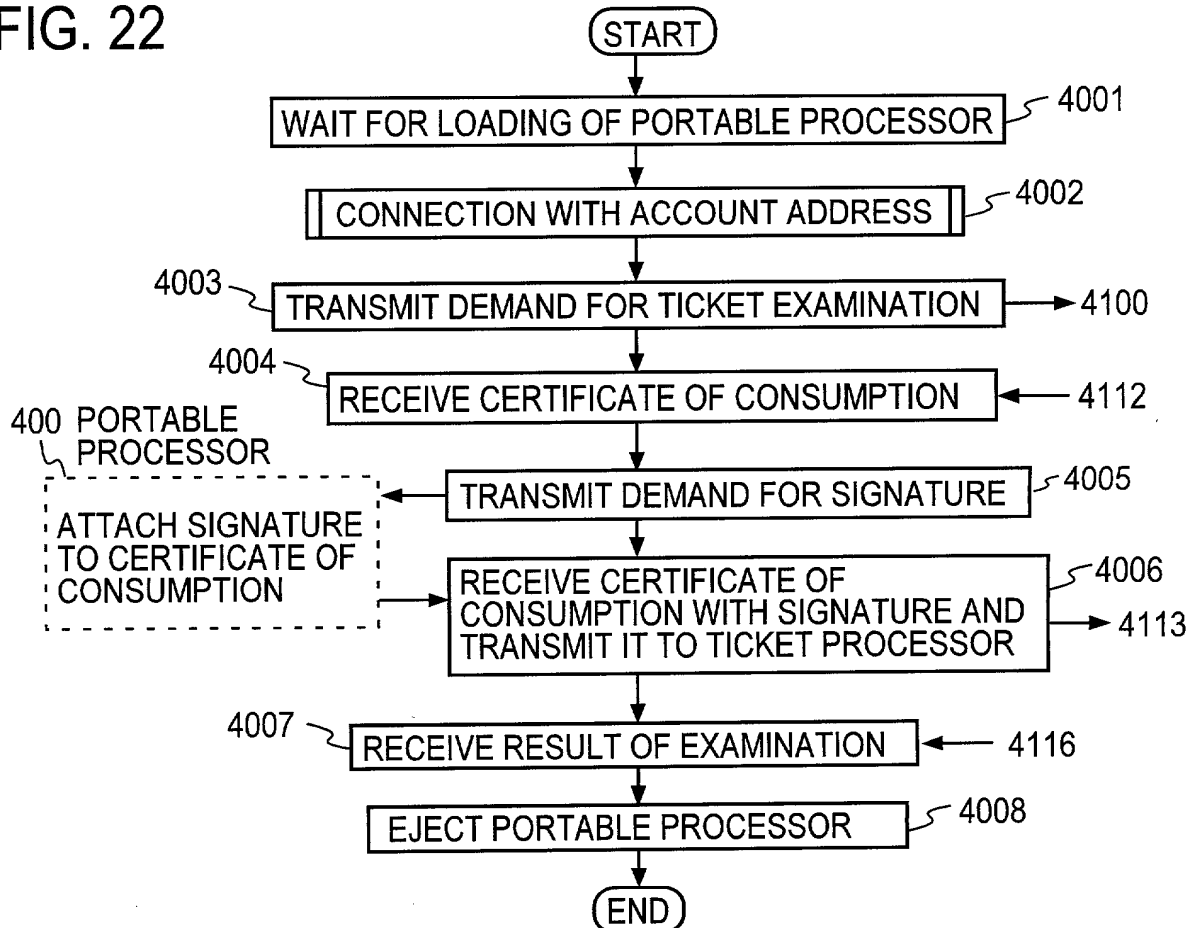


FIG. 23

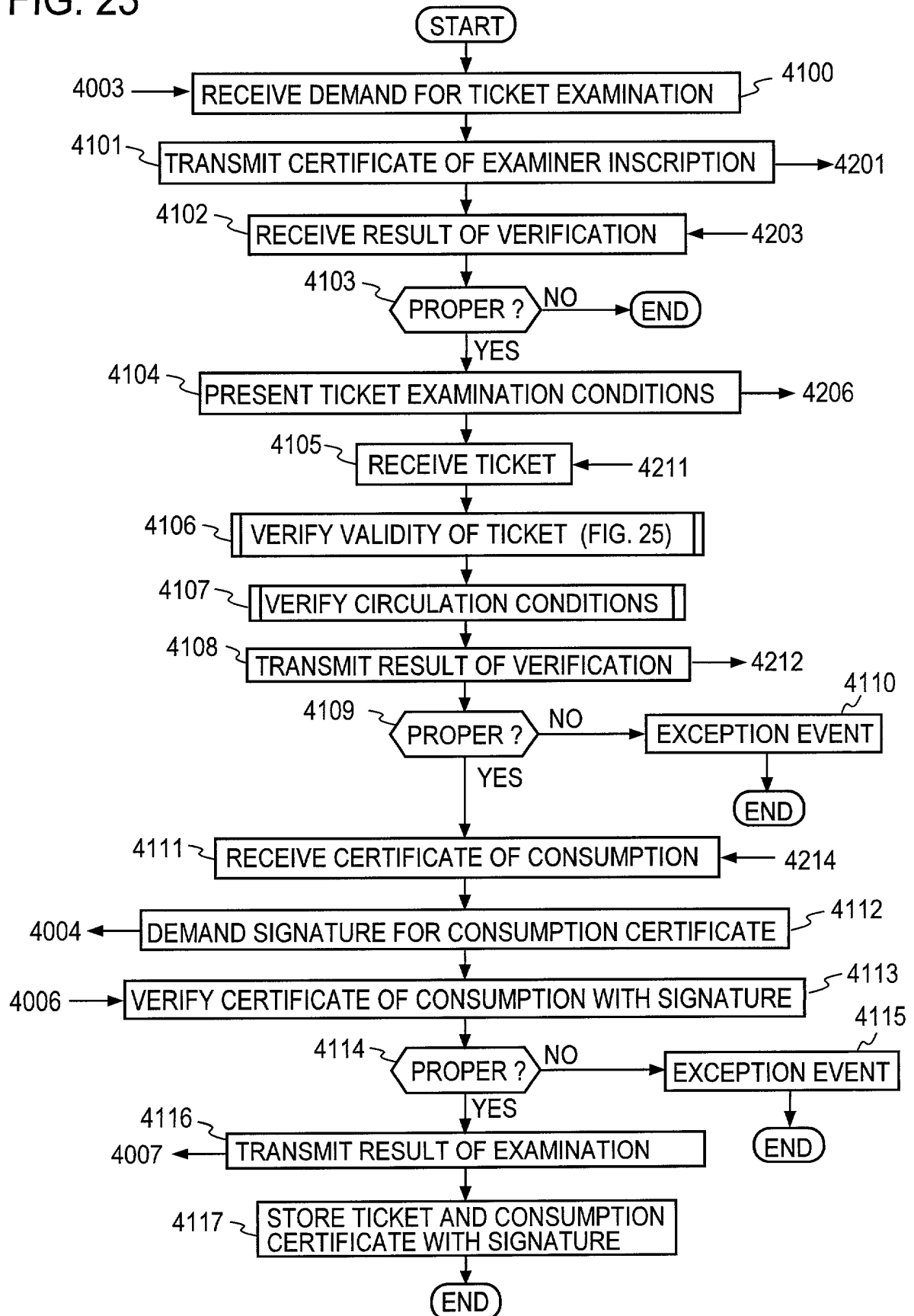


FIG. 24

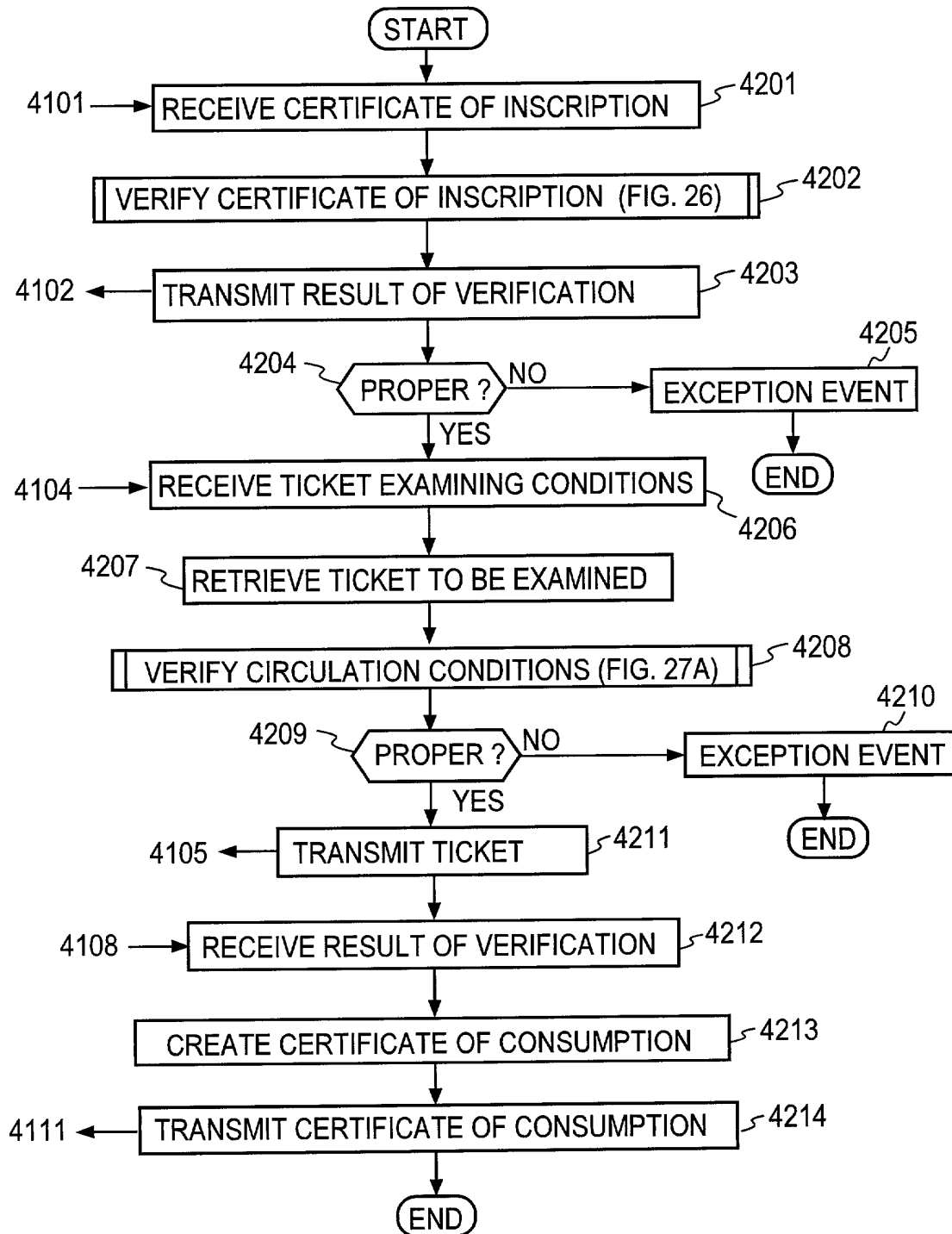


FIG. 25

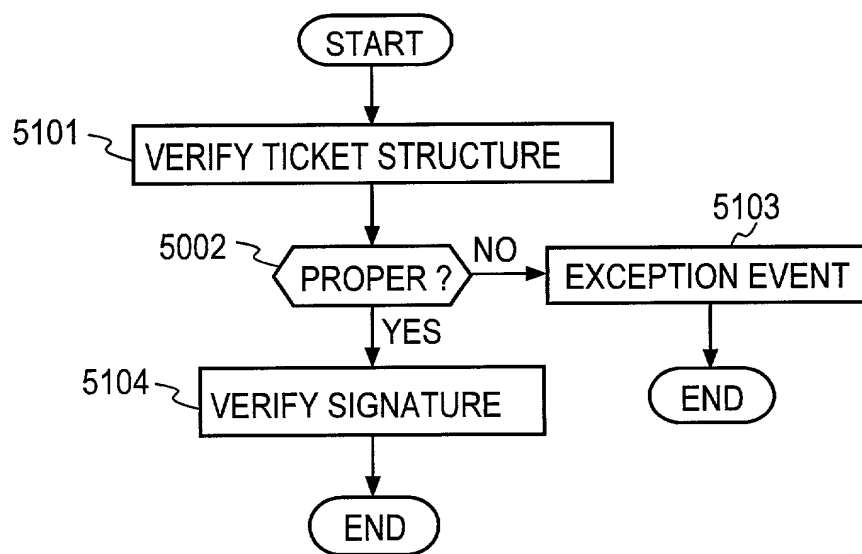


FIG. 26

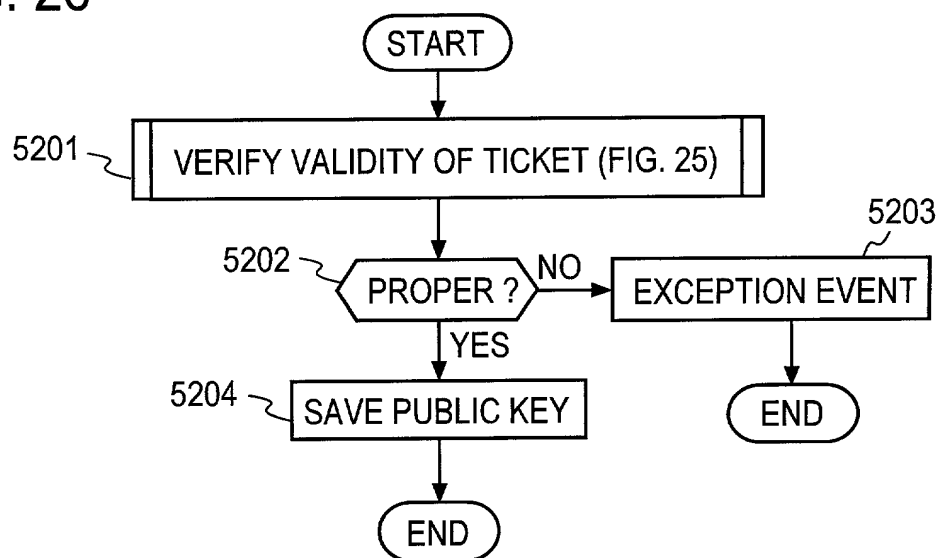


FIG. 27A

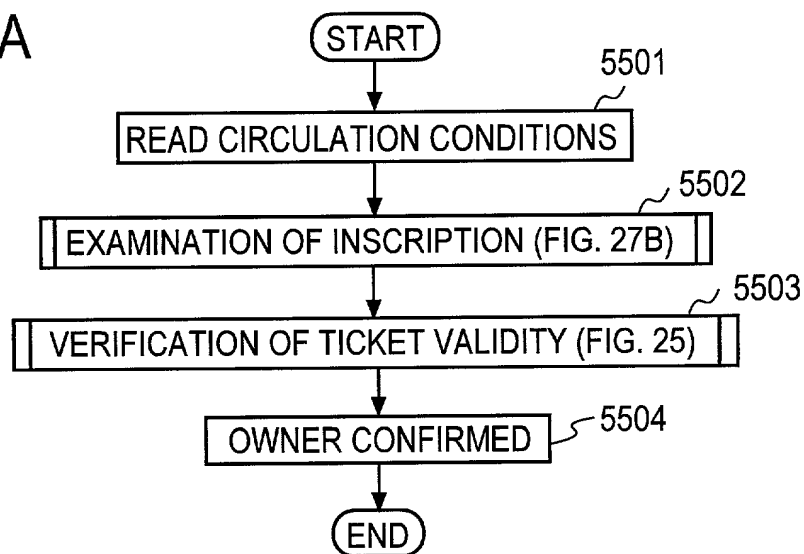


FIG. 27B

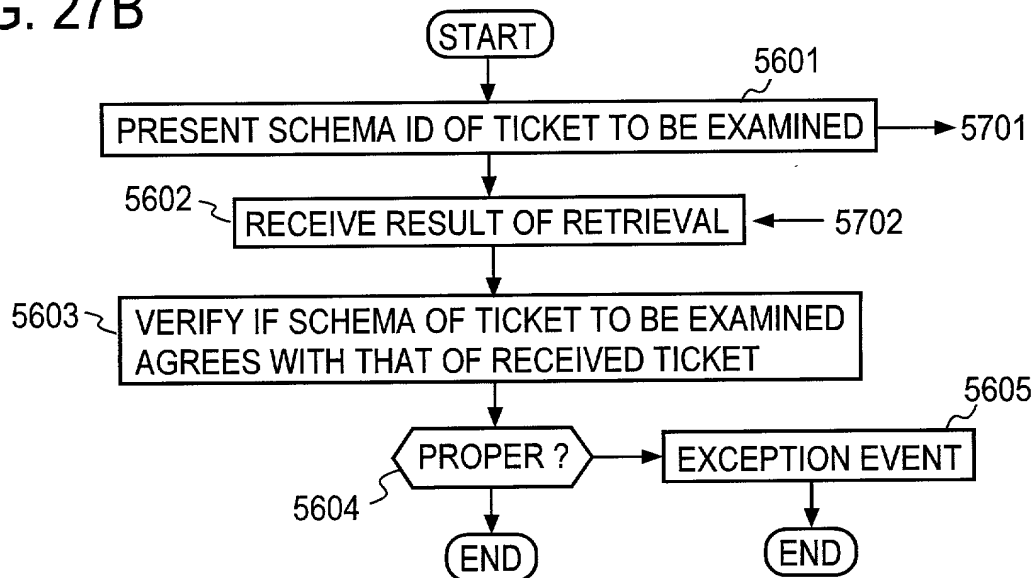


FIG. 28

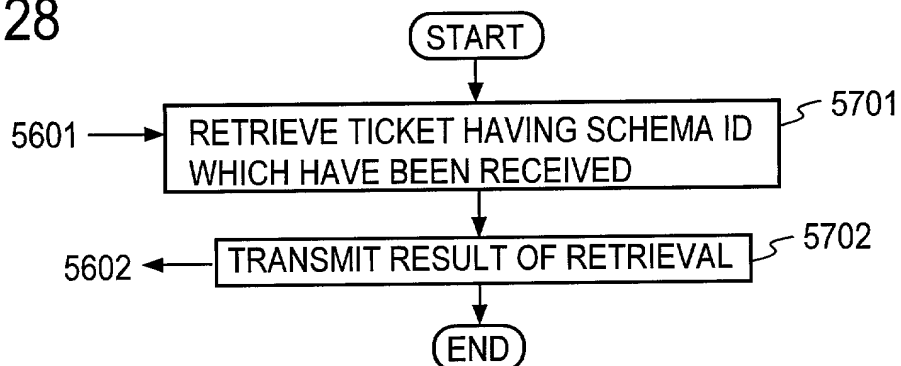


FIG. 29

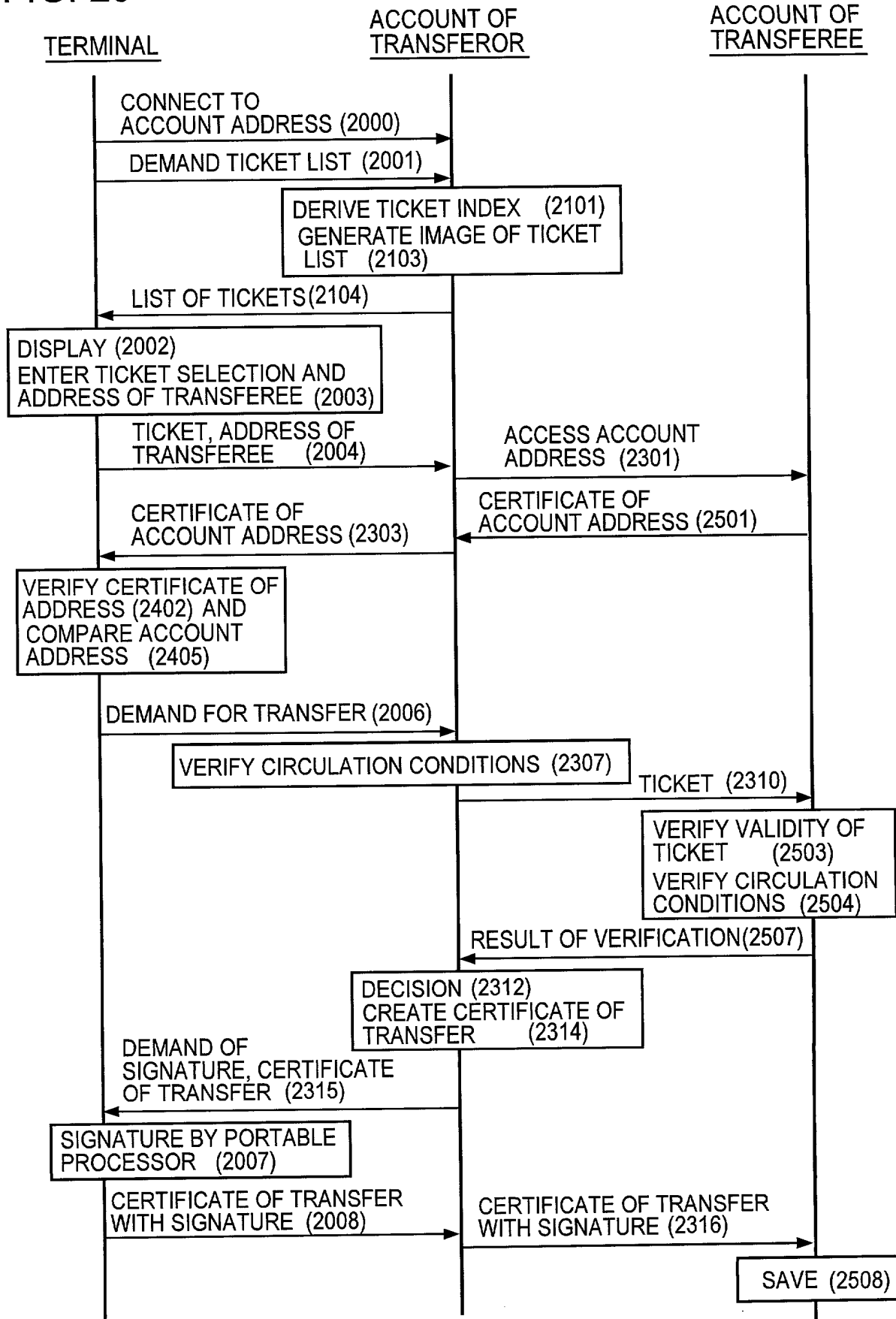


FIG. 30

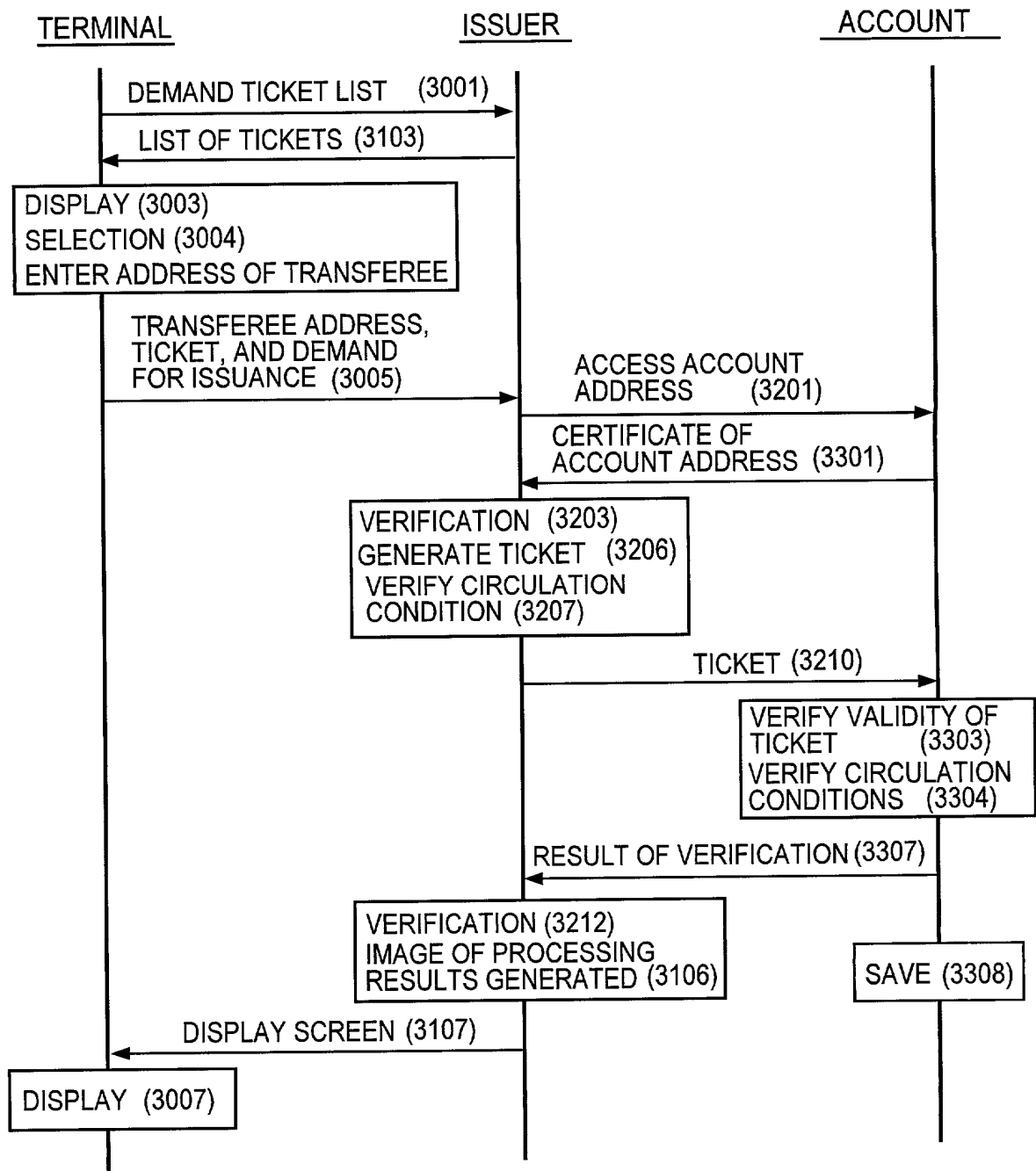
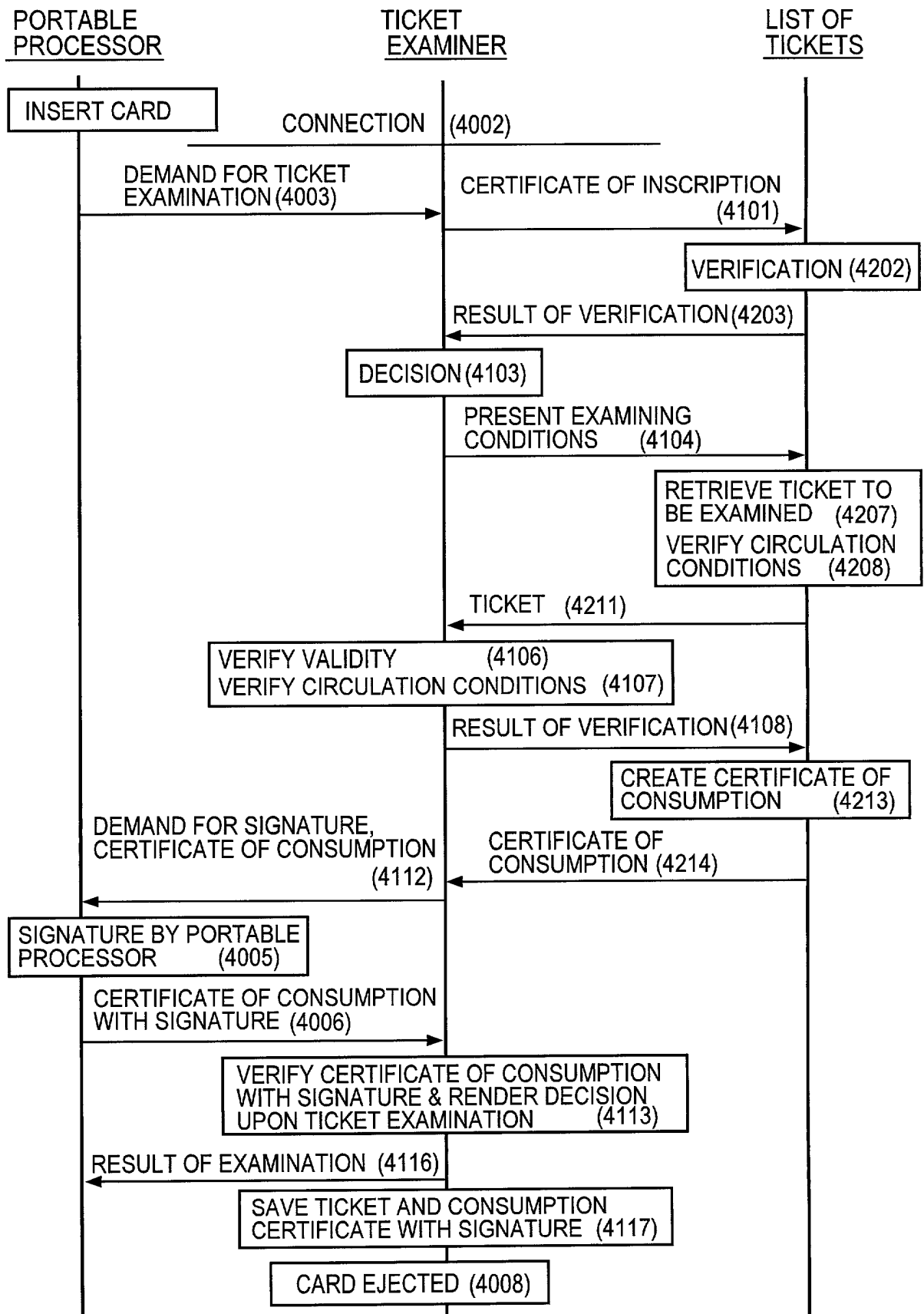


FIG. 31



DECLARATION FOR PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PLEASE SEE THE ATTACHED SHEET

the specification of which. (check one)

[XX] is attached hereto. [] was filed on 19_____, as United States Patent Application Serial No. or PCT International Application Number _____, and was amended on 19_____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 CFR § 1.56(a).

Prior Foreign Application(s): I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate listed below, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Application No.	Country	Filing Date	Priority Claimed
159596/99	Japan	07/06/99	<input checked="" type="checkbox"/> []
(Application No.)	(Country)	(Day/Month/Year Filed)	Yes No
_____	_____	_____	[] []
(Application No.)	(Country)	(Day/Month/Year Filed)	Yes No
_____	_____	_____	[] []
(Application No.)	(Country)	(Day/Month/Year Filed)	Yes No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

Application No.	Filing Date
_____	_____
_____	_____

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by 35 U.S.C. § 112, first paragraph, I acknowledge the duty to disclose material information as defined in 37 CFR § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(U.S. Application Serial No.)	(U.S. Filing Date)	(Status--patented, pending, abandoned)
_____	_____	_____
(U.S. Application Serial No.)	(U.S. Filing Date)	(Status--patented, pending, abandoned)

I hereby appoint George Vande Sande, Registration No. 17,276; Burton A. Amernick, Registration No. 24,852; Stanley B. Green, Registration No. 24,351; Richard Wiener, Registration No. 18,741; Townsend M. Belser, Jr., Registration No. 22,956; Morris Liss, Registration No. 24,510; Martin Abramson, Registration No. 25,787; George R. Pettit, Registration No. 27,369; Elzbieta Chlopecka, Registration No. 32,767; Eric J. Franklin, Registration No. 37,134; Jeffri A. Kaminski, Reg. No. 42,709; and William E. Curry, Registration No. P43,572, my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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DECLARATION FOR PATENT APPLICATION

Page Two

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Residence Address _____

Citizenship _____

Post Office Address _____

Full name of fifth joint inventor (if any): _____

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Citizenship _____

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Post Office Address _____

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Full name of eighth joint inventor (if any): _____

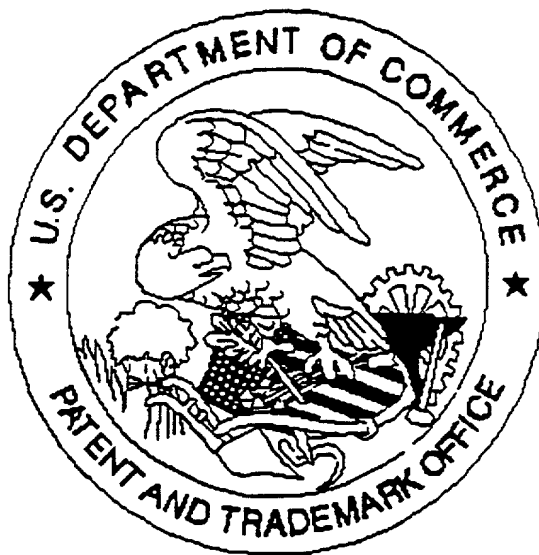
Inventor's Signature _____ Date _____

Residence Address _____

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